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Using Photovoice to Navigate Social-ecological Change in Coastal Maine: a Case Study on Visibility, Visuality, and Visual Literacy

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USING PHOTOVOICE TO NAVIGATE SOCIAL-ECOLOGICAL CHANGE IN COASTAL MAINE: A CASE STUDY ON VISIBILITY, VISUALITY, AND VISUAL LITERACY

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USING PHOTOVOICE TO NAVIGATE SOCIAL-ECOLOGICAL CHANGE IN COASTAL MAINE: A CASE STUDY ON VISIBILITY, VISUALITY, AND VISUAL LITERACY

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Dissertation Advisor: Dr. Laura Rickard

An Abstract of the Dissertation Presented
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Media representations of the environment support specific cultures of viewing that can create expectations about how to observe social-ecological interactions in everyday life. While public perceptions may appear, in some cases, to reflect these normative representations, more critical and participatory approaches to environmental research and management have begun to complicate these representations as they are negotiated through intrapersonal, interpersonal, and group communication. Working from a visual cultural approach that interrogates issues of visibility, visuality, and visual literacy, this dissertation theorizes how coastal residents represent their own observations and experiences of environmental change through photography and what impact their views have on the perceived availability, desirability, and feasibility of community responses to change. For this project, I designed and facilitated a multi-stage photovoice project and a Q method evaluation that engaged a small group of residents from the communities surrounding the Bagaduce and Damariscotta Rivers in Maine. Across the three main chapters, I critically and collaboratively analyze the affordances of photography as a research methodology, visual communication practice, and social-ecological assessment tool. In the second chapter, I document the social-ecological changes residents perceived to impact their community and how

related interactions were framed as inevitable, manageable, and deconstructive. In the third chapter, I explore how residents used photographs in individual interviews and group discussions and through material and dialogic exchanges to broaden, focus, and shift their meaning-making. In the fourth chapter, I evaluate how the photovoice methodology influenced participants' perceived development of visual learning and communication skills and discuss implications for photovoice goal attainment. Together, this research indicates that environmental applications of photovoice may inspire resilience thinking through group negotiation of visual meaning and critical reflection on self-other-environment relationships. In turn, this research offers new possibilities for understanding and engaging visual representations of social-ecological change that constitute community experience and influence environmental adaptation.

and most importantly, I thank my dear partner Jill for being my principal advocate and sharing in the often-sticky pursuit of environmental communication. Your creativity, patience, and grace paint endless opportunities with love.

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CHAPTER 1

INTRODUCTION

This chapter serves as a practical and theoretical overview of the contexts that shaped this dissertation. It starts with a reflection about my positionality as a social science scholar, undergraduate instructor, and Sustainable Ecological Aquaculture Network (SEANET) research fellow. Next, it summarizes key ecological and cultural characteristics of the communities where this research took place. Then, it defines the theoretical concepts of visibility, visuality, and visual literacy, which inspired my research design. Finally, it outlines the content of the following chapters, including the questions and approaches driving this research, as well as the insights they have contributed.

Researcher Reflexivity

I am an interdisciplinary social science scholar who studies how media representations of the environment shape understanding about social-ecological interactions and change. I am particularly interested in what dichotomies, such as social/ecological, risk/benefit, expert/layperson, subject/object, and concrete/abstract, can teach us about navigating and negotiating difference in everyday life. I view these dichotomies as social constructs and cognitive heuristics that structure relationships and influence meaning-making.[1] My past research focused on how risks and benefits are framed in environmental journalism content (Duffy & Rickard, 2017; Duffy et al., 2020) and produced through journalism routines that prioritize balance and conflict

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[1] This view is influenced, in part, by existing environmental communication scholarship that problematizes the separation of nature and culture (e.g., Cronon, 1996; Hansen & Cox, 2015; Marafiote & Plec, 2006; Peterson et al., 2007). The term dichotomy is used to emphasize the categorical division as a social construct rather than a mutually exclusive condition (i.e., binary).

(e.g., economic development versus environmental conservation; Duffy & Rickard, 2019). While teaching public and visual communication courses, I was able to explore the impact of these dichotomies on everyday perceptions. In particular, I encouraged students to identify and interpret them through interpersonal, professional, and mediated communication contexts, so they could evaluate how these dichotomies influence their relationships with each other and the environment and discover where there are opportunities for critical reconstruction. These interests and experiences have informed my dissertation research, which explores patterns of knowledge and understanding that complicate the communication frames popularized through environmental journalism and management practice.

My past research and teaching indicate that media representations of the environment often privilege dichotomies and that do not match the complexity of local views. This disconnect can weaken the utility of media for understanding community relationships, negatively impact environmental management decisions, and incite opposition or conflict. To me, the first step to engage and remedy this disconnect is to identify and define the environmental communication frames that are most salient to individuals within a particular community. This means prioritizing local knowledge and participation in research to contextualize local problems, challenge normative assumptions, and reveal novel management solutions (Lang et al., 2012; Mitchell, 2011; Rose, 2016; Wilmsen et al., 2008).

This approach to knowledge and research reflects my own constructivist orientation. In other words, I situate knowledge as the product (construction) of subjective and transactional encounters, which are mediated through different spatial, temporal, and social contexts (Lincoln & Guba, 2013). I view research as a continuous process of inquiry that improves understanding through "the reconstruction or extension of existing constructions and/or the development of new

constructions" (p. 61). To support this process, I accept that individuals and communities see the world differently, and my research attends to the structures and contexts that privilege certain views over others. This critical constructivist approach has encouraged me to interrogate how issues of access (which I conceptualize in this dissertation as visibility) and representation (here, visuality) inform individual values and assert social control.

SEANET Integration

This dissertation supported the Sustainable Ecological Aquaculture Network (SEANET),[2] a federally funded, multi-institutional, interdisciplinary research effort to understand the opportunities and challenges associated with further integrating and developing the marine aquaculture industry in Maine. SEANET research was organized around a social-ecological systems (SES) framework, modified from the Ostrom SES framework (McGinnis & Ostrom, 2014), which provided researchers with a shared vocabulary and theoretical model for identifying, integrating, and interpreting the relationship between various marine system components and related processes (Johnson et al., 2019). The SES framework considers social and ecological system components equally through exploration of the interactions and outcomes among subsystems, including the resource system (e.g., subtidal zone), resource units (e.g., oysters), governance system (e.g., state aquaculture leasing program), and its human actors (e.g., coastal residents), as well as broader social, economic, and political settings (e.g., news media). This framework helped researchers determine where their research fit within the broader SEANET

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effort and, in the case of my dissertation research, identify what interactions and outcomes needed further exploration.

My dissertation research was informed by my experiences working with SEANET as a graduate fellow on the Human Dimensions team. One of the primary goals of this team was to understand the social and economic dimensions of marine aquaculture development, including public perceptions and resilience to change. The team's research efforts, including but not limited to media analyses (Duffy et al., 2020; Duffy & Rickard, 2017; Rickard et al., 2018; Rickard & Feldpausch-Parker, 2016) and spatial visualization (Duffy et al., 2020); an aquaculture lease hearing analysis (Hanes, 2018); and a national (Murray et al., 2017; Rickard et al., 2020) and statewide (Alvarez et al., 2019) survey; as well as my own attendance at public information meetings, revealed how local experiences of change were often framed adjacent to aquaculture development. For example, issues such as eelgrass conservation, migratory bird habitat, recreational boating, and visual aesthetics[3] were repeatedly discussed by local residents in relation to aquaculture, but they were not necessarily emphasized by SEANET researchers. This interaction between aquaculture development and other coastal changes presented an opportunity to further engage community members' everyday understanding and construction of community and, perhaps, to reveal issues salient to aquaculture development, yet overlooked by extant SEANET research. As public perceptions of these interactions and outcomes are central to understanding community resilience, my dissertation research endeavors to contextualize local experiences of change from the perspective of coastal residents. In doing so, my research extends existing

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[3] Aquaculture development research by SEANET (Hanes, 2018; Johnson & Hanes, 2019) and others (Dalton et al., 2017) has identified and explored the relationship between visual aesthetics and social carrying capacity (i.e., the level of use deemed acceptable or desirable by social standards).

SEANET work and informs perceptions of aquaculture development situated within the Bagaduce and Damariscotta River estuaries.

Study Sites

This research focuses on the observations and experiences of coastal residents living in two regions: the Bagaduce River and Damariscotta River estuaries (Figure 1.1, Table 1.1). The Bagaduce River is a 14.3-mile tidal river in Hancock County, Maine that empties into Penobscot Bay. The Damariscotta River is a 19.0-mile tidal river in Lincoln County, Maine that empties into the Atlantic Ocean between Casco Bay and Muscongus Bay. The Damariscotta River lies about 50 miles southwest of the Bagaduce River along the Gulf of Maine coast. Each river has been designated a "Focus Area of Statewide Ecological Significance" due their high ecological productivity, particularly within intertidal mudflats, which provides habitat for a diversity of native species, such as eelgrass (*Zostera marina*), horseshoe crabs (*Limulus polyphemus*), soft-shell clams (*Mya arenaria*), marine worms (*Glycera dibranchiata*, *Nereis virens);* diadromous species, such as American eels (*Anguilla rostrata*) and alewives (*Alosa pseudoharengus*); as well as a number of migratory waterfowl and shorebirds (Beginning with Habitat, 2021). Five rural towns surround the Bagaduce River, and seven rural towns surround the Damariscotta River.

Both regions were inhabited by Indigenous Wabanaki ("People of the Dawn") tribes for thousands of years, and their prehistoric shell mounds preserve a cultural and environmental history of shellfishing (Neptune, 2015; Schmitt, 2017; University of Maine, 2021). Between the 17th and 19th centuries, European settlement, colonization, and often violent land dispossession in the region gave way to industrial development (Schmitt, 2017; Lackovic, 2019). In particular, timber, fishing, and shipping industries contributed a number of ports, shipyards, brickyards, mills,

Figure 1.1

Map of study sites

Bagaduce River

Damariscotta River

Note. All data are from the Maine GeoLibrary Data Catalog (Maine.gov).
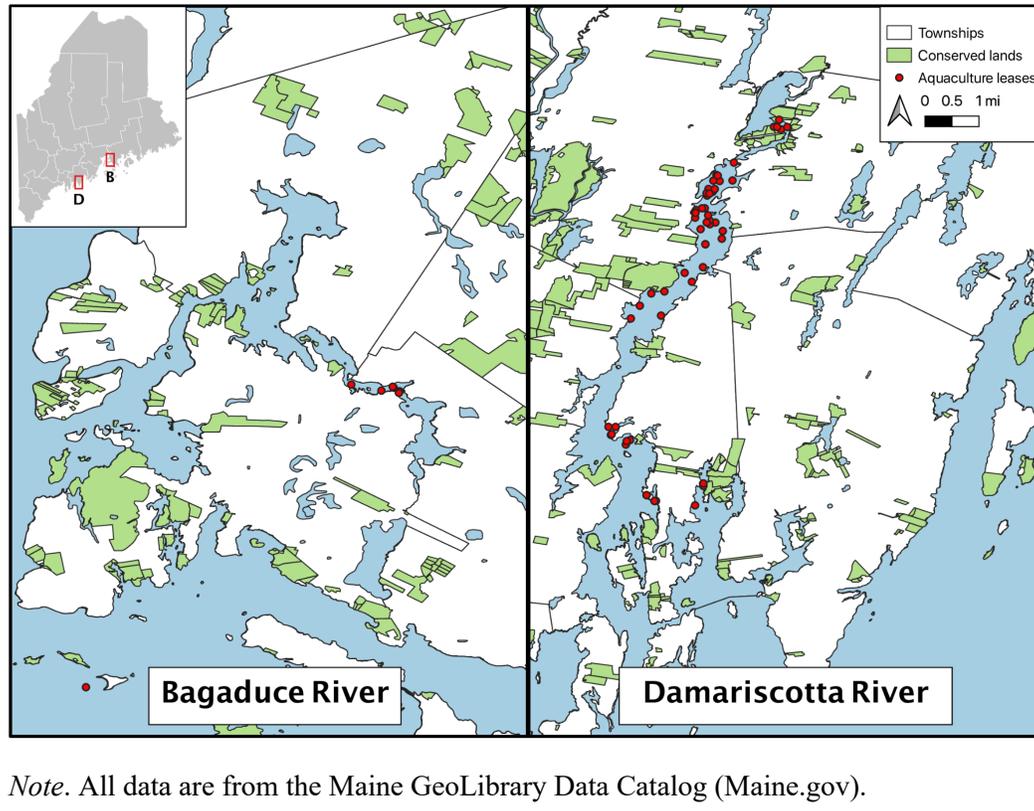
and canneries, as well as to the decline of native fisheries (Schmitt, 2017; Lackovic, 2019). Today, these regions have largely transitioned away from resource extraction and commodity production to more amenity-based land uses, such as conservation, recreation, tourism, and seasonal residences (Hanes, 2018; Johnson & Hanes, 2018). Concurrently, these regions have cultivated an oyster aquaculture industry, which is conducted using surface or bottom cages, surface rafts, and submerged lines on public waters leased by the Department of Marine Resources (Table 1). In the Damariscotta region, oyster aquaculture started in the 1970s, due in large part to the establishment of the Darling Marine Center in 1965, and it has since grown to be the largest oyster aquaculture region in the state, producing more than 80 percent of the state's oysters (Maine DMR, 2021;

Lackovic, 2019; University of Maine, 2021). In contrast, oyster aquaculture in the Bagaduce region

started in the late 1990s and has been met with more opposition by community members and non-

governmental organizations (Hanes, 2018; Johnson et al., 2019; Johnson & Hanes, 2018). The

differences in aquaculture development and extent offer an important point of contrast in two

regions that otherwise reflect much of coastal Maine.

Table 1.1

Select demographic and aquaculture data

	Bagaduce	**Damariscotta**	**Maine**
Total population	7,219	13,390	1,344,212
Median age	45.1	52.7	45.1
Median household income	$59,023	$61,987	$58, 924
Percent seasonal housing	37.6	35.5	17.2
Number of standard aquaculture leases	2	25	112
Number of limited purpose aquaculture leases	8	75	749

Note. Demographic data are from the 2019 ACS Estimates (U.S. Census Bureau, 2021). Aquaculture data are from the Maine Department of Marine Resources (DMR, 2021).

Visibility, Visuality, and Visual Literacy

This research draws from concepts and theories on visual culture, including visibility,

visuality, and visual literacy (Figure 1.2). Mirzoeff (1998) defines visual culture as "a fluid

interpretive structure, centered on understanding the response to visual media of both individuals

and groups" in everyday life (p. 4). This definition positions visual culture as a postmodern "tactic"

to study the nonlinear "interaction between viewer and viewed" in different material,

technological, dialogical contexts (p. 13). These everyday interactions are "visual events" that contribute information, meaning, and affect, and they can be used to address questions about social relations, difference, and power (Mirzoeff, 1999; Rose, 2016).

Figure 1.2

Theoretical approach to the dissertation
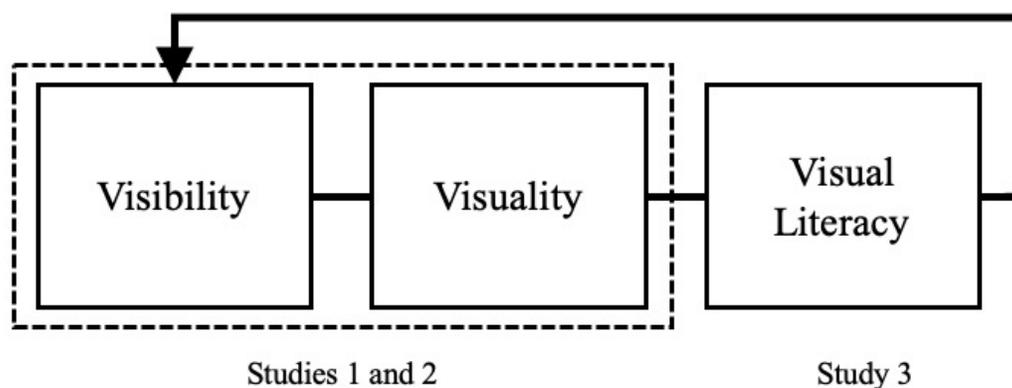
Note. The first two studies in this dissertation explore how the visibility of environmental issues (i.e., their capacity to be seen) is dependent on their visuality (i.e., their condition as a social construction). The third study explores how the tensions between visibility and visuality can be engaged through visual learning and communication (i.e., visual literacy) practices.

Whereas vision tends to be defined as the capacity to see, visibility can be defined as the capacity to be seen. This distinction highlights the interaction between a physiological process and the qualities or conditions that influence perception. Visibility is an important consideration for environmental communication research and practice because many social-ecological issues are invisible (e.g., pollution, disease), which can make them difficult to detect, document, and act upon (Gifford, 2011; Peeples, 2011). Concerns about the consequences of invisibility are frequently cited in climate change research (Rudiak-Gould, 2013). In particular, researchers acknowledge the

role of spatial and temporal scale in shaping opportunities for both direct observation (e.g., Reser & Bradley, 2019) and mediated communication (e.g., Doyle, 2009; Duan et al., 2019). For example, there is regular debate about the efficacy of attributing observable events, such as hurricanes, floods, and wildfires, to climate change (e.g., Spence et al., 2011). These debates tend to focus on the temporal distinction between weather and climate and the technical abstraction of climate change measurement and uncertainty, which render it invisible (Rudiak-Gould, 2013). To address the difficulty in direct observation, researchers have investigated the role of visual media in increasing the salience of climate change (e.g., Metag et al., 2016; O'Neill et al., 2013) and decreasing its psychological distance (e.g., Loy & Spence, 2020). This work often connects issues of visibility with behavioral intention or action, and it has informed best practices for communication. For example, Climate Visuals, a website and image library, offers seven core principles for climate change communication based on research: show real people; tell new stories; show climate change causes at scale; show emotionally powerful impacts; understand your audience; show local (but serious) impacts; and be careful with protest imagery (climatevisuals.org). Its image library is organized around climate causes, impacts, and solutions, and it largely comprises photographs aggregated from multiple sources that are available to download directly or from third-party websites.

Historically, photographs have served as a predominant visual tool to communicate the impacts of climate change and other environmental issues. Photographs are known in particular for their indexical quality, which means there is a strong physical relationship between a photograph and the phenomena it depicts (Messaris, 1994; Peirce, 1991). As a result, photographs are often imbued with a truth-telling quality and used to provide documentary evidence (Barthes, 1980), which news media and environmental campaigns have leveraged to increase public and

political attention on environmental impacts (Delicath & DeLuca, 2003; Doyle, 2007; Hansen, 1991; McGaurr, 2016; Schwarz, 2013). That said, the indexical quality and temporal condition of photographs privileges communication about discrete events rather than long-term processes (Doyle, 2009; Hansen, 1991). Doyle (2009) suggests that this "proves catastrophic in the context of climate change," because preventative actions are necessary "*before its effects [can] be seen*" (p. 280, emphasis in original). As a result, the affordances of photography may actually reinforce the tensions between visibility and invisibility, and in turn influence the social construction of environmental issues.[4]

The tensions between visibility and invisibility and related attempts to make the invisible visible characterize the concept of visuality. Visuality can be defined as "the condition of everyday life in which social context, interaction, and power are enacted through the visual," which includes "not only the social codes about what can be seen and who is permitted to look, but also the construction of built environments in relation to these looking practices" (Sturken & Cartwright, 2018, p. 458). In other words, visuality is an ideological process that frames vision and visibility through different cultural and historical positionalities (Kaszynski, 2016), and engaging the politics of visuality requires consideration for the practical and symbolic ways in which authority is asserted through visual means (Sturken & Cartwright, 2018). For example, in a review of the dispute over climate change visibility, Rudiak-Gould (2013) suggests that concerns over "terminological exactitude" and "empirical accuracy" limit the visibility of climate change and "shackles public acceptance of climate change to public trust of climatologists" (pp. 123-124). In other words, this dispute over visibility privileges scientific authority while minimizing the agency

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[4] Photographs of past events can be used as visual exemplars of potential futures (e.g., Rickard et al., 2017) but not without ethical questions concerning the correlation between separate events and related framing of uncertainty.

of nonscientists to communicate about climate change. Of course, more collaborative and participatory approaches to environmental research and management challenge this separation between scientific and local knowledge (Shirk et al., 2012). Such approaches "help the other see climate change" through their own experience and related environmental constructions (Rudiak-Gould, 2013, p. 129).[5]

Understanding how visuality is entangled in observation and mediated communication is the charge of visual literacy. Visual literacy is a spectrum of visual learning and communication skills that can empower understanding of and resistance to visual constructions through critical acts of interpretation and creation (Avgerinou and Pettersson, 2020; Dallow, 2008). To engage visual literacy means attending to the four sites of meaning-making (production, content, circulation, and reception) and their modalities (social, compositional, and technological), as well as questioning their cumulative intents and impacts (Rose, 2016). For example, while photographs maintain their privileged status as documentary evidence, their content and composition are always the product of selection and manipulation, which tend to reflect the "tacit imperatives of taste and conscience" (Sontag, 1977/2001, p. 6). A photographer necessarily determines what phenomena is seen and how through real-time framing and often post-production editing. Selection of specific photographic frames may, in turn, support more iconic qualities, wherein the photograph represents phenomena through symbolic or analogical approximation (Messaris, 1994). To this end, a photograph may depict a melting glacier as a proxy for climate change. However, the salience of that frame, and consequently the visibility of climate change, is not ensured. Rather, it is negotiated by its audience, who, if given access, project their own culturally-embedded

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[5]The invisibility of environmental issues is relative and may reflect a privileged positionality that neglects the disproportionate experience of impacts (Norgaard, 2012; Schlosberg & Collins, 2014).

experiences and relations onto the photograph. Building visual literacy skills therefore means understanding the role of visuals as sociopolitical constructions that shape visibility and, with that knowledge, creating new ways of seeing (Berger, 1972).

Building on climate change communication research and participatory methods for community engagement, this dissertation extends consideration for climate in/visibility to other, often related, complex social-ecological changes that can be observed and experienced in everyday life. A multi-stage photovoice project is used to explore the visuality of change in coastal communities, and a Q method evaluation is used to determine the project's impact on coastal residents' visual learning and communication practices. This novel application of photovoice integrates concepts and theories of visual culture and social-ecological systems to understand how photographic interactions can shape and negotiate opportunities for community understanding and adaptation amid inevitable change.

Chapter Overview

In this section, I briefly describe the following chapters to provide an overview of the questions and approaches driving this research, as well as the insights they have contributed. The three main chapters each rely on a different aspect of a photovoice study conducted with residents in the Bagaduce and Damariscotta River regions (Table 1.2). In the second chapter, I present a qualitative analysis of the social-ecological changes participants observed and communicated through participatory photography and photovoice. I ask how participants individually and collectively frame change using resilience as a descriptive and analytical framework. The results demonstrate that participants frame change as an inevitable, manageable, or deconstructive process of social-ecological interaction. This reveals how the perceived availability and acceptability of

community responses, including adaptation, depend on the spatiotemporal attribution of change drivers and impacts.

In the third chapter, I present a qualitative analysis of the pragmatic intent and constitutive impacts of photography across individual interviews and group discussions (Pezzullo & Cox, 2018). Here, I build on the photovoice analysis to ask how photographs function as material and dialogic sites of meaning-making. In particular, this work explores the ways participants broadened, focused, or shifted photographic meaning through different communication contexts. The results show different material and dialogic relationships among participants and me, which often contributed to broadening in interviews and focusing or shifting in group discussions.

In the fourth chapter, I present a mixed-method participatory analysis of photovoice using Q method. This study explores the visual literacy practices participants engaged through photovoice and how those practices influenced participants' assessment of the methodological goals, including to record community conditions and promote local knowledge through critical dialogue. The results indicate that participant assessment of visual learning, visual communication, and methodological goals was dependent on whether they viewed photovoice as an individual or social endeavor and the extent to which the project structure met related expectations.

Together, these chapters integrate and extend ideas about the visual communication of social-ecological change in everyday life. In the fifth and final chapter, I reflect on the three main chapters and consider what we can learn about the affordances of photovoice as a research methodology, visual communication practice, and social-ecological systems assessment tool. In doing so, I explore how photographic production, content, and reception open a dialogic space for individual and social learning about the complex interactions between everyday constructions of environmental change and community responses. These considerations and contributions provide

a collaborative model for community engagement and research that can inform local issue prioritization and framing, and they reveal opportunities for additional research to negotiate the in/visibility of future environmental change.

CHAPTER 2

VISUALIZING SOCIAL-ECOLOGICAL CHANGE AS INEVITABLE, MANAGEABLE, AND DECONSTRUCTIVE: A PHOTOVOICE CASE STUDY

Introduction

Maine's coastal communities are embedded within a complex, social-ecological system that is increasingly vulnerable to change (Maine Climate Council, 2020). Changes to the abundance of native species, frequency of natural hazards, reliance on natural resources, and prioritization of management options can impact local relationships and identity. In some places, these changes can threaten existing visions of community and incite conflict (e.g., Hanes, 2018), while in other places these changes can catalyze new visions of community and build opportunities for collaborative development (e.g., Beh et al., 2013). The capacity of communities to adapt depends on their identification, construction, and incorporation of specific changes into their visions of everyday life. This study focuses on those visions, including community observations and knowledge about the coastal changes they experience. It builds on existing participatory research that reveals the visibility and visuality of environmental change in different community contexts (e.g., Bennett & Dearden, 2013; Masterson et al., 2018) and uses a novel application of the photovoice methodology to contextualize how perceptions about social-ecological interactions at different spatiotemporal scales influence the perceived availability, desirability, and feasibility of adaptive responses (Carpenter et al., 2001; Cote & Nightingale, 2012; Norris et al., 2008; Sinclair et al., 2017). This study demonstrates that coastal residents tend to frame change as an inevitable, manageable, and/or deconstructive process. Each frame has theoretical implications for understanding the perceived relationship between social-ecological interactions and community resilience and practical implications for navigating and negotiating community acceptance or

resistance to specific changes. The study begins with a brief discussion of social-ecological change and related tensions in defining responses to change through resilience. Next, it introduces how photovoice was used to capture community visions through participant-generated photography. Finally, it presents community narratives that visualize experiences of change and discusses implications for community interactions, identity, and adaptation.

Social-Ecological Systems, Change, and Resilience

Social-ecological systems (SES) is a theoretical concept and field of research that aims to cope with the complexity of resource management problems related to environmental change. SESs are defined by the interdependent linkages between social and ecological changes across different spatial, temporal, and organizational scales (Partelow, 2018). They are characterized by dynamic, non-linear, and often unpredictable behavior and feedbacks between multiple nested subsystems and their components or variables (Ostrom, 2009). The most comprehensive and well-cited framework for diagnosing interactions and outcomes in an SES delineates four subsystems, including the resource system, resource units, actors, and governance system (McGinnis & Ostrom, 2014). SES approaches focus on how these subsystems and their variables interact to produce outcomes at the system level and in turn impact each subsystem (McGinnis & Ostrom, 2014). Because SES research cannot address all social-ecological interactions, most analyses focus on a specific problem context and geographic setting. The primary goal of SES analyses is to diagnose "why some SESs are sustainable whereas others collapse" (Ostrom, 2009, p. 420). Given this focus on change as an interactive process, SES research tends to be associated with other concepts and theories that address how SESs respond to change, most notably resilience.

The concept of ecological resilience was introduced by Holling (1973) to describe the capacity of ecosystems to absorb disturbances and maintain their configuration of relationships. This definition shifted the focus of research on ecosystem dynamics from stability, which emphasizes equilibrium, to an emphasis on variability and persistence. This non-linear view of ecosystems suggests they comprise multiple stable states, and the persistence of any one state is dependent on the amount of change it can withstand before transitioning to a different state. Holling (1986) observed that some ecosystems can absorb disturbances through a process of reorganization and adaptation, commonly referred to as the adaptive cycle, which modifies their ecological resilience and vulnerability to state change. In doing so, Holling acknowledged the role of human intervention and the impact of natural resource management on the future trajectory of ecosystems, including the possibility of transformation (Gunderson, 2000). This consideration for the interdependence of social and ecological systems inspired more interdisciplinary conceptualizations of resilience and the exploration of cross-scale interactions and feedback related to community adaptation (Adger, 2000; Folke, 2006; Folke et al., 2010; Janssen et al., 2006).

Despite widespread adoption of social-ecological resilience as a concept, process, and analytical framework, there are critiques about the parallels drawn between social and ecological system dynamics. In particular, researchers point to the epistemological tensions associated with viewing social dynamics through a normative frame that seeks to enhance institutional rules and designs through interventions that support "expert-defined boundaries [and] circumscribe desirable systems" (Powell et al., 2014, p. 137). As a normative-interventionist concept, resilience cannot account for heterogeneous social processes and relations that dictate resource access, valuation, and leadership (Brand & Jax, 2007; Cote & Nightingale, 2012; Hamborg et al., 2020).

At best, resilience research that prioritizes governance systems and interventions provides an incomplete picture of social responses to change (Cote & Nightingale, 2012). At worst, governance interventions can actually sustain hegemonic "power-knowledge regimes" that create vulnerability (Hamborg et al., 2020, p. 2). Rather than focus on the structure and functionality of social systems, researchers increasingly advocate for a descriptive-analytical approach that explores how human agency, power dynamics, and cultural values are constructed and contested in the individual and social contexts of everyday life (Christensen & Krogman, 2012; Cote & Nightingale, 2012; Keck & Sakdapolrak, 2013; McGreavy, 2016; Sinclair et al., 2017). Such approaches recognize that everyday observations and knowledge about ecological change are intimately informed by spatiotemporal locales, which not only impact the definition of system boundaries and thresholds but also the perceived availability, desirability, and feasibility of adaptive responses (Carpenter et al., 2001; Cote & Nightingale, 2012; Cumming & Collier, 2005; Norris et al., 2008; Sinclair et al., 2017).

The epistemological tensions between normative-interventionist (pragmatic) and descriptive-analytical (constitutive) approaches to resilience are embedded within and enacted through academic and colloquial discourse about social-ecological resilience (McGreavy, 2016; Powell et al., 2014). In resilience research, communication is framed pragmatically as an information resource that can enhance the adaptive capacity of communities and constitutively as a dialogic practice that reveals the divergent needs, views, and attitudes within them (e.g., Houston et al., 2015; Norris et al., 2008). In everyday life, dialogic contexts and practices dictate the use and utility of communication resources, and in turn, the various ways communities come to frame social-ecological interactions and respond to community change (Buzzanell, 2010; McGreavy, 2016). In other words, studying how communities understand and engage social-ecological change

is a prerequisite for advocating solutions. To that end, this research takes a descriptive-analytical approach to explore the change frames that communities constitute through everyday communication about social-ecological interactions. This study specifically addresses the role of communication in creating, maintaining, or resisting opportunities for community adaptation to change, and it asks the following research questions:

RQ1.　　How do coastal residents in Maine frame social-ecological change?

RQ2.　　How do these change frames construct social-ecological interactions?

Photovoice

Photovoice is a community-based qualitative research methodology that uses participatory photography (Balomenou & Garrod, 2016; Byrne et al., 2016) and photo elicitation (Harper, 2002; Laptena, 2011) to identify, represent, and evaluate community issues (Wang & Burris, 1997). It invites community members to photograph their everyday experiences and engage the photos through critical reflection and group discussion (Latz, 2017).[6] The method integrates constructivist orientations in critical pedagogy, feminist research, and documentary photography to problematize power relationships and related assumptions about what and who constitute knowledge and expertise (Wang & Burris, 1994). The method was originally designed to empower rural community members by giving them more control over research that assessed their public health needs and the programs or policies implemented to address those needs (Wang & Burris, 1997). Since its inception, photovoice has been adapted to explore many different issues and contexts,

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[6] Photovoice researchers commonly refer to group discussions as focus groups; however, given the extensive literature on focus group design (e.g., Barbour, 2007) and inconsistent applications in photovoice research, I prefer the use of "group discussion."

including social justice (e.g., Breny & McMorrow, 2020), gender and sexual identity (e.g., Christensen et al., 2020), and environmental change (e.g., Bennett & Dearden, 2013).[7]

In environmental contexts, photovoice has been used to research land management practices (e.g., Beh et al., 2013; Kong et al., 2015), water management issues (e.g., Chanse et al., 2017; Bisung & Elliott, 2019), and ecosystem services (e.g., Berbés-Blázquez, 2012; Masterson et al., 2018). Despite the growing number of photovoice studies in this area, further evidenced in recent reviews (e.g., Fantini, 2017; Derr & Simons, 2020; Mitchell et al., 2020), few connect processes of environmental change with community resilience. Among those studies that do, some use community resilience as motivation to identify the various changes communities perceive as important to address (Bennett & Dearden, 2013), whereas others focus on how communities respond to specific changes they have experienced, such as those associated with natural hazard events (Hissa, 2016; Madsen & O'Mullan, 2016) and climate change impacts (Baldwin & Chandler, 2010; Bulla & Steelman, 2016). These studies contribute an understanding of what changes, attitudes, and behaviors shape community resilience, but they do not address how change itself is conceptualized as an antecedent to resilience. To address this gap, this study focuses on the way individuals construct community resilience through photovoice interviews and discussions about social-ecological interactions and change.

Site Selection

I selected two river regions for theoretical and practical reasons. First, this study complements existing interdisciplinary research conducted by the Sustainable Ecological

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[7] A more in-depth explanation of the photovoice method, including its theoretical origins and goals, is provided in Chapter 3.

Aquaculture Network (SEANET) concerning the resilience of the aquaculture industry in Maine (Johnson et al., 2019; Bricknell et al., 2021). Second, both regions have experienced an influx of Eastern oyster (*Crassostrea virginica*) aquaculture development, which is leased on public waters and has prompted different responses from local residents, non-governmental organizations, and newspaper media (Duffy et al., 2019; Hanes, 2018; Johnson et al., 2019). Third, both regions have undergone postproductive transition and amenity migration, which indicates a decline in resource extraction and commodity production and an increase in recreation, tourism, and seasonal housing (Hanes, 2018; Johnson et al., 2019). Finally, the regions vary with respect to their geographic area, proximity to protected parklands, and industrial history.

Participant Recruitment

I recruited participants in the Bagaduce and Damariscotta River regions in Maine from July 2019 to February 2020 using snowball and criterion sampling (Lindlof & Taylor, 2011). Snowball sampling is an iterative process wherein a community contact provides participant referrals, who in turn provide additional participant recommendations. To support this process, I created a website to centralize information about project goals, activities, participation criteria, and participant sign-up. Then, I contacted local organizations (e.g., libraries, churches, watershed associations, conservation trusts, research institutions) and town offices for referrals of residents who live near the Bagaduce or Damariscotta River and regularly access it for leisure, recreation, or work. While these were the only criteria for participation, I regularly emphasized my desire to include a diversity of perspectives, including participants that rely on different resource sectors (e.g., agriculture, fisheries, aquaculture) and participate in different recreational activities (e.g., hiking, kayaking, boating). Community contacts from local organizations and town offices

referred more than 50 local residents. I contacted each resident by phone and/or email to share

project information, invite them to participate, and identify additional participant referrals.[8] At the

same time, I produced a recruitment flyer and project information card, which I physically posted

on community bulletin boards in each region and digitally distributed through six organizations'

email subscriber networks. Finally, I held four public information meetings, two in each region,

which were advertised in local newspapers and introduced the project to prospective participants.

All residents who wanted to participate and met the selection criteria could join the project,

and 17 residents agreed to participate, including nine residents from the Bagaduce region and eight

residents from the Damariscotta region. Before the start of data collection, seven residents

withdrew from the project (Table 2.2). In the Bagaduce region, two males withdrew due to

scheduling availability and two females withdrew due to concerns about Covid-19. In the

Damariscotta region, two males withdrew due to scheduling availability and one female withdrew

due to Covid-19.[9] This provided a final sample of ten participants, five residents from each region

(Table 2.1). All participants were white, the majority of participants were female, the average age

of participants was 59 (range = 27-77), and the average number of years they lived locally was 20

(range = 2-48). Two participants in each region were retired, and one participant in each region

was employed by the oyster aquaculture industry. Despite the variety of recruitment efforts,

participant demographics for this project reflect existing participatory research, which tends to

engage white, middle-aged, and highly educated participants (NASEM, 2018; Pateman et al.,

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[8] Only one referral did not meet the selection criteria because the resident lived on a different river and did not regularly access the river of interest.

[9] Participant retention is a common challenge for participatory research, and participant attrition is often due to the required time investment and/or the perceived complexity of the research topic (Fischer et al., 2021; Latz, 2017).

2021). That said, the ten participants represent enough diversity in local knowledge and experience to engage the broad theoretical topic of social-ecological change.

Table 2.1

Overview of photovoice participants

ID	Region	Age	Sex	Education	Years Local	Work Status	River Proximity	River Access	Primary River Use
01	Bagaduce	47	F	High School	28	Active	< 500 ft	Daily	Work, Leisure, Recreation
02	Bagaduce	72	M	College	42	Retired	< 500 ft	Daily	Leisure
03	Bagaduce	27	F	College	5	Active	< 5 mi	Weekly	Leisure, Recreation
04	Bagaduce	74	M	Postgrad	20	Active	< 1000 ft	Weekly	Leisure, Recreation
05[a]	Bagaduce	77	F	Postgrad	20	Retired	< 500 ft	Daily	Leisure, Recreation
06[b]	Damariscotta	75	F	Postgrad	48	Retired	< 500 ft	Daily	Leisure, Recreation
07	Damariscotta	64	F	College	15	Retired	> 10 mi	Monthly	Leisure
08	Damariscotta	37	F	Postgrad	2	Active	> 10 mi	Daily	Work
09	Damariscotta	71	F	Postgrad	18	Active	< 500 ft	Daily	Leisure
10	Damariscotta	45	F	College	6	Active	< 5 mi	Daily	Leisure

[a] This participant contributed photographs and participated in a photo elicitation interview but did not elect to join the group discussion in their region.
[b] This participant elected to participate with her husband, and they are treated as one participant per their request.

Data Collection

I facilitated all data collection between March 2020 and July 2020. Participants in the Bagaduce region attended an in-person orientation at a local community center in March 2020,

and participants in the Damariscotta region attended a remote video orientation meeting in April 2020 due to public health guidelines for Covid-19 (average length = 95 minutes). Those participants unable to attend these meetings completed an individual video orientation meeting in April 2020 (average length = 30 minutes). During the orientations, I introduced and discussed photovoice aims and expectations, as well as the ethics associated with photography. Following the orientation, I asked participants to complete two photography assignments: (1) *Take photos to show what you value about the river and its surrounding communities*, and (2) *Take photos to show what changes affect how you value the river and its surrounding communities*. For the second assignment, I encouraged participants to interpret the concept of change openly and did not advise them to focus on any specific domain (e.g., physical, ecological, social, cultural, political, historical, etc.). I then provided participants with eight weeks (April-June 2020) to take at least 10 original photographs, including five in response to each assignment, and asked them to journal a caption for each photograph that included their motivation for taking the photo and the meaning they ascribed to it. Participants took an average of 19 photographs (range = 9-71).

I used participant photographs and captions to guide the semi-structured photo elicitation interviews (average length = 60 minutes), which I facilitated remotely via video in June 2020 (Harper, 2002; Lapenta, 2011). During the interview, I asked participants to summarize their approach to photography and their photo collection before describing each individual photo and the way it responded to one or both assignments. Participants dictated the order of photo presentation and discussion, and I followed up with clarifying questions. At the conclusion of the interview, participants selected two of their photos, one from each assignment, to share with the group at their regional discussion.

Table 2.2

Overview of project activities and data

Phase	Period	Activities	Participants	Data
Participant recruitment	Jul 2019 - Feb 2020	Site visits; networking; phone calls; emails; public info meetings; newspaper advertisements; website creation	17	N/A
Project orientation	Mar - Apr 2020	Project introduction; photography ethics, consent, and safety; photography assignments; and project planning	15	N/A
Participatory photography	Apr - Jun 2020	Photography; and caption journaling	10	Participant-produced photos (193) and captions (166)
Photo elicitation interviews	Jun 2020	Photo discussion	10	Audio transcripts (10)
Regional group discussions	Jul 2020	Photo discussion; theme summarization	9	Audio transcripts (2)
Project evaluation	Jan 2021	Statement sorts; debriefing interviews	8	Q sorts (8) and audio transcripts (8)

Note. Participants indicates the total number of residents from the Bagaduce and Damariscotta regions retained through the end of the phase period; differences in participant number indicate attrition. The final phase, project evaluation, is addressed in chapter 4.

I facilitated one remote video discussion per region in July 2020 (average length = 140 minutes). During the group discussions, I presented the photographs in a random order for each assignment. I briefly introduced each photo using information from its caption and asked participants who did not take the photo to respond to it before asking the photographer to relay

their own motivation and meaning. I selected this process to provide enough context about each photo to start the discussion but not limit alternative interpretations by participants.[10] Once each photo per assignment was discussed, I asked participants to collaboratively identify the overall issues that defined their discussion of that assignment. At the conclusion of the group discussions, I asked participants to identify further opportunities and challenges facing their region that may not have been captured in their discussion. The orientation meetings, individual photo elicitation interviews, and group discussions were video-recorded with permission and transcribed for analysis.

Data Analysis

I qualitatively coded text from audio transcriptions of the photo elicitation interviews and group discussions following an iterative and inductive process. The overall issues identified by participants during group discussions guided first-cycle coding of all transcription data (Miles et al., 2014).[11] Participants identified more than 50 issues related to the two photovoice assignments. To prepare for first-cycle coding, I collapsed these issues into six provisional codes: human development and intervention; access to nature and natural resources; community knowledge and perceptions; place culture and tradition; natural processes; and ecological health. I coded transcript data in NVivo Pro 12 using these provisional codes and added emergent codes iteratively as I worked through each discussion and interview transcript. Frequent overlap between coding

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[10] To prompt group discussion, photovoice facilitators often develop their own questions or employ a mnemonic, such as SHOWED or PHOTO to invite the photographer or other participants to start the discussion (Hergenrather et al., 2009; Latz, 2017; Wang, 1999). In this study, the participants addressed many of these questions in their captions, which the researcher relayed during the photo introductions.
[11] During first-cycle coding, I started with the group discussion transcripts and then moved to the interview transcripts. During subsequent coding cycles, I moved back and forth between different transcripts to compare specific codes and address emergent coding questions or conflicts.

categories indicated that social and ecological categories were interrelated. To account for these relationships and attend to their interactions, as identified in previous research (e.g., Bennett & Dearden, 2013; Masterson et al., 2018), I conducted causation coding to contextualize the perceived drivers and impacts of change (Miles et al., 2014). Causation coding revealed scalar complexities, including the relationship between participants' spatiotemporal framing and perceptions of drivers versus impacts of change. To address these issues and connect emergent themes with resilience theory, I conducted second-cycle pattern coding to compare the spatiotemporal framing of four exemplary anecdotes, including seasonal transitions, nature preservation, aquaculture development, and an alewife restoration (Miles et al., 2014). The anecdotes facilitated the creation of three pattern codes, which I describe in the results as change frames.[12]

Results

Participants primarily used three frames to discuss their photographs of social-ecological change during individual interviews and group discussions: (1) change as inevitable, (2) change as manageable, and (3) change as deconstructive. These change frames will be used to analyze the results of the photovoice project.

Change as Inevitable

Photographs taken by participants explored a number of social-ecological changes they perceived as inevitable processes that dictate their relationship with the river and community.

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[12] The term "frame" is used to emphasize how the pattern codes and related anecdotes function as "interpretive packages" participants used to construct and order their meaning-making (Gamson & Modigliani, 1989, p. 1; Goffman, 1974; Putnam & Majia, 1992).

Figure 2.1

Photos depicting inevitable change

Moving clockwise from top left: (a) tides and seasons, (b) ice out, (c) salt marsh greening, (d) horseshoe crab spawning, (e) alewife migration, and (f) riverbank erosion.

Participants tended to describe these changes as cyclical and continual, citing changes they experience daily, such as the movement of the sun and tides, as well as seasonal changes experienced over the course of the project, such as the retreat of ice, the greening of foliage, and migration of wildlife. For example, a photo of a beach on one participant's property in the Damariscotta region prompted group discussion about the predictability of tides and how that impacts their ability to engage with the environment (Figure 2.1a).

> I'm really intrigued by low tide as a time to go explore this place that's kind of hidden from us at other times. And also, as the tide goes in and out, it's just constantly changing the edge of the rivers, never the same. (08)

This participant, like others, suggests the cyclical nature of tides is reliable. They anticipate tidal changes twice per day and coordinate their actions in response. Similarly, another participant reflected on the planning needed to swim in the river and bay because "the tides don't care what your workday is" (07). That said, participants also admitted this uncontrollable "change is part of the value" (06) of living so close to the river.

These examples reveal a spatiotemporal tension that participants experienced between cyclical change and continual change. They connected the daily tides with longer trends associated with flooding and sea level rise, offering photos that represented an increase in "dramatic precipitation events" (06) and the "gradual erosion" (06) of the river banks. These trends prompted participants to discuss how their community might respond to the changes through amendments to existing infrastructure or new development, including "raising the roads" (08) and "build[ing] a bridge" (10). However, these responses tended to be framed as part of the regular maintenance of private and public spaces, including reorienting docks and boardwalks, as opposed to novel adaptation.

Just as the tides helped participants structure their day, the inevitable transition of seasons oriented participants to annual activities that shape their community's relationship with the river. For example, several photos from the Bagaduce region invited discussion about the cultural importance of river ice. To describe one of the photos to their group (Figure 1b), a participant read an excerpt from their caption:

> Winter marks the return of smelt shacks to the upper Bagaduce. Locals will dig out their smelt houses, pull them up river and stick them onto the ice following instinct, as well as the river's channel. (01)

Seasonal experiences like this stimulated feelings of anticipation and excitement for participants, who suggested their continuation across generations is an "encouraging" (06) signal of social and ecological health. In contrast, participants also used seasonal experiences to trace changes that diverged from their expectations, such as the timing and extent of ice coverage from year to year. However "disconcerting" (07) some of the unexpected seasonal changes have been, participants suggested any seasonal change creates the opportunity for "shared knowledge and shared connections" (08), and they suggested this shared experience is what actually creates community.

Taken together, participants' experiences of inevitable change throughout the day and across seasons reveal how their relationship with the physical environment shapes their sense of community. Their photos represent the multiple, interconnected levels of change they are bound to experience, whether or not they observe them. That said, participants acknowledged the creative force of intentional observation, which some attributed to the photovoice method.

> It's really about showing up to the [same] places again and seeing what had happened …
> respecting that change, without seeking much more than being present … because it's
> something that is going to happen. (10)

By observing that "everything's in flux" (06) and "always transitioning" (02), participants suggest they are able to respond with the same "resilience that happens with the land and water" (08). Participants therefore use ecological processes as a guide for their behavior, framing the inevitability of change as a kind of productive fatalism that is associated with acceptance and opportunity as opposed to resignation and paralysis. This acceptance enables them to look forward and move to the "next phase [which] is a little different but yet the same" (07).

Change as Manageable

Many photographs taken by participants explored social-ecological changes that had been enacted to manage their relationship with the river and community. Participants tended to describe these changes as a form of maintenance, citing changes that protected and/or restored desirable

Figure 2.2

Photos depicting manageable change
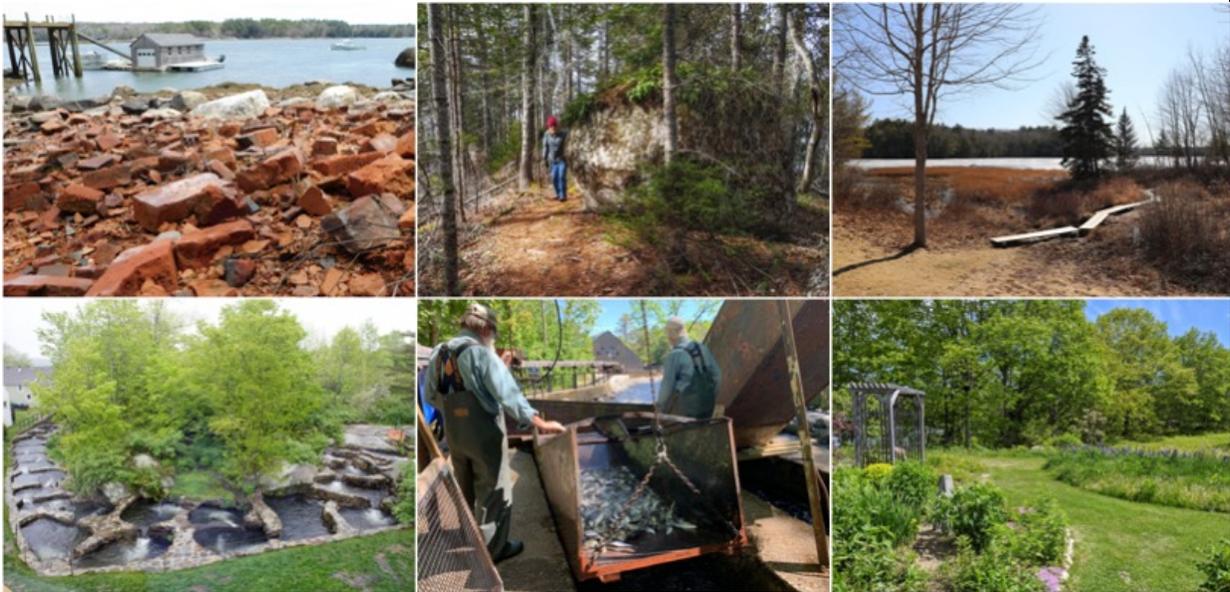
Moving clockwise from top left: (a) industry development, (b) nature preservation, (c) conservation easement, (d) garden stewardship, (e) alewife harvest, and (f) fish ladder restoration.

community characteristics and minimized future change. For example, one participant in the Damariscotta region summarized the photos they took for the project by reflecting on the way the oyster aquaculture industry maintains the working waterfront lifestyle in Maine:

Mainers have always made a living and supported themselves from the water and the ocean resources. And as those resources change, to be nimble and resilient, we need to be changing our industries as well. (08)

This participant suggests that environmental changes, such as increasing water temperature, threaten other resource industries, such as the lobster fishery, and presents aquaculture as a novel extension of the state's industrial history and resource dependence. Their photograph of an aquaculture wharf adjacent to an abandoned brickyard prompted group discussion about the relationship between inevitable and manageable change (Figure 2.2a):

The impact [change] can have on the land, aesthetically, as well as economically and environmentally … shows that change is inevitable, and some things don't last forever, especially if you don't maintain them. (07)

There's the change we can control and the change that we can't, and the water is a conduit for so much of this, which can also change if it's not monitored or cared for. (10)

Here, participants imply their community has an ethical responsibility to enact desirable changes in situations they can control, or else suffer the consequences of environmental degradation. In doing so, they reveal their instrumental orientation to the river and acknowledge the need to "think historically" (07) about the impact of past changes on current livelihoods and use that information to prioritize future actions.

Participants in the Bagaduce region also cited historical conditions to support specific approaches to management. In particular, several photos from participants focused on the role of nature preserves and non-governmental organizations in maintaining areas that have not been significantly impacted by human development. One participant offered a photo of an erratic boulder on a local trail to emphasize how a conservation trust had "saved" an area from proposed

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development and "visions of trophy homes" (05, Figure 2.2b). In responding to the photo, participants suggested that the preserve not only protects the current state of the environment from future "exploitation," but it also "anchors [them] in the reality of the past" (08). By acknowledging their role as historical "newcomers" (06), participants sought to maintain the intrinsic value of the environment by "living alongside what's happening" (01). This reveals the relationship they observe between intrinsic value and instrumental use, where preservation areas minimize change while continuing to offer access to nature and natural history, which they feel is increasingly under threat from development. Further, they suggest public access can foster greater appreciation for local species and habitats and awareness of the conditions that support their survival. Despite a proposition from one participant that trails on preservation land "constrict" or "curate" (07) how they experience the river, participants believed they still offer vital opportunities for appreciation and awareness that may inspire support for more community preservation efforts. These efforts include individual management decisions on residential property, such as establishing a conservation easement (Figure 2.2c) and native landscaping (Figure 2.2d).

Whereas aquaculture development and nature preservation represented protective changes, participants also described restorative changes. For example, the majority of photos from two participants in the Damariscotta region focused on the reconstruction of a fish ladder, which was completed in 2017. Their photos documented the restored abundance of alewives (*Alosa pseudoharengus*) and "the spring ritual for people" (08) to observe their migration upstream. This restoration effort follows three centuries of industrial development in the area, and it represents the economic and cultural importance of alewives despite successive disturbances, including the construction of a dam and the original fish ladder. To speak to this historical importance, one participant offered a photo of harvesters and harvesting equipment to show how the alewives

supported a "traditional fishery" (09), which in turn contributed local livelihoods and, at one time, an international food product (Figure 2.2e). In a subsequent photo of the reconstructed fish ladder, the participant explained how until recently "there had been no incentive to keep it up" due to a "moratorium on harvesting because of the [low] population of fish" (Figure 2.2f). Despite the loss of the economic incentive and the "deteriorating" (07) condition of the original fish ladder, a community organization leveraged fundraising to reconstruct the fish ladder. Participants framed the effort as a "success" (09) that "show[s] how the community in this area is so connected to the ecosystem of the river" (08). That said, some participants also used this relationship to problematize the historical need for restoration:

> Dams and fish ladders are that historic change event that ... navigate and negotiate our relationship with nature in a way that benefits humans first, and here we are, how many decades or centuries later ... remediat[ing] our initial impact. (10)

For this participant, the restoration serves as a reminder that management is inherently anthropocentric, and the relationship between social and ecological priorities shift as impacts are realized over time. Indeed, one participant admitted that the restoration "just wasn't about alewives, it was about being a part of a community effort" (09). In this case, participants acknowledge the ecological incentive for restoration cannot be separated from social priorities and suggest their alignment is a necessary condition for community resilience. Whereas the economic value of alewives could not sustain their population in the past, participants expressed hope that their cultural value will help maintain them for the future.

Change as Deconstructive

A few participant photographs explored the social-ecological changes they perceived to deconstruct[13] their relationship with the river. Participants described these changes through experiences of loss, which they reflected on while summarizing the photos they submitted.

Figure 2.3

Photos depicting deconstructive change

From left to right: (a) neighborhood history and (b) aquaculture encroachment.

For example, one participant in the Bagaduce region introduced their project by reflecting on the way the various changes they depicted had impacted their perception of community:

> Some or maybe most of the changes that have occurred particularly in recent history have
>
> sort of deconstructed a lot of traditional values of community, or what we think of as

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[13] Here, the concept of deconstruction is defined through participant discourse that focused on the loss of specific community characteristics (deconstruction) rather than total community transformation (destruction). This definition is distinct from social theories of deconstruction that question the hierarchies constituted through discourse, especially pertaining to oppositions (e.g., visibility versus invisibility), and complicate the reducibility or stability of meaning (Derrida, 1967/2016).

community. And when I was thinking of resilience, I was thinking about that deconstruction and then the inspiration to recreate other forms of community, which have taken place. So where there has been change or loss, there have been … replacements for some of those losses, but not always. (06)

Here, the participant refers to changes to the agricultural history of the area, which they evidenced through photos of various industrial artifacts "coughed up" from the landscape. Further, they described the feeling of loss associated with the transition "away from agricultural users … toward just residential use." To exemplify this loss, the participant offered a grayscale photo of a defunct greenhouse, where a general store once stood adjacent to a family grave site (Figure 2.3a). The participant described the site as a "nexus for the neighborhood" and "agricultural base for their livelihoods," where residents would swap local knowledge and stories while purchasing daily necessities. Within the past few years, such establishments have been replaced by "large markets and box stores" and "highways have been like cleavers," limiting regular interaction with neighbors and threatening to further bury the local agricultural history. The participant attributed this change to shifts in local demographics, related increases in seasonal residence, and the broader view of Maine as a "safe haven" away from more industrial development. Despite expressing hopes that some local history might be reclaimed, the participant acknowledged that "the direction things are headed does not seem to be catastrophic for the river." By focusing on the legacy of agricultural heritage, as opposed to the ecological degradation, the participant framed this experience of loss as more sociocultural than ecological. To respond to this loss, they described novel community efforts that could reestablish cultural exchange, including a new brewery and neighborhood association, as well as an individual interest in "keeping some of the agricultural

usage alive through modest garden efforts." In doing so, the participant expressed a desire to spread their "reverence" to other local areas "foreseen as potentially lost or eroded."

In the Damariscotta region, one participant joined the photovoice project to express their "frustration" with the oyster aquaculture development adjacent to their riverfront property. More than half of their photos, including several that depicted oyster aquaculture trays floating on the surface of the river, prompted discussion about the impact of aquaculture on their access to the river and experience of community:

> We got a quarter mile or half a mile of shorefront [and] we're allowed to actually use a tiny piece of it. … The family went looking for property and chose this because it had access [to] deep water for the boats. And then in the 80s, the whole oyster thing came along … And that basically took away a lot of what we had bought the land for. (06)

This participant's family has owned the property for over sixty years, and they used one photo to trace the development of oyster aquaculture as it expanded toward town from the lease site near their shorefront (Figure 2.3b). In contrast, they offered photos of the river before the oyster trays are installed each spring to show what the river looked like "when they bought it" and perhaps "as the Indians saw it thousands of years ago." As riparian landowners, they are regularly invited to public hearings for each proposed lease, where they have expressed their concerns about boating and fishing access, as well as the ecological health and sustainability of the river. However, as leases continued to be granted, they felt they had not only lost access but also their agency to voice their concerns: "We used to go to all those meetings back years ago, but they were basically cut and dry, the decision was made, and so I just throw [the public notices] in the trash can now." Importantly, the participant does not attribute this loss to the industry itself, which they admit contributes some "good neighbors" and community livelihoods. Instead, the participant attributes

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it to the Department of Marine Resources, the state agency responsible for aquaculture leasing and management, whom they suggest has "abrogated the responsibility for doing things safely and wisely" on the river. As a result, the participant feels they "no longer have waterfront property" and therefore "don't interact with the river as much." They hope their photo collection can show the impact the aquaculture industry has on individual landowners, as well as their lack of control over water rights.

While these two participants expressed distress over what has been lost, participants in both regions also anticipated navigating more transformative losses in the future. These perceptions were not depicted in photographs but again emanated from individual and group reflection on the broader implications of everyday experiences of social-ecological change and related threats to their community. For example, one participant in the Bagaduce region suggested that "climate change will threaten the way of life" for many farmers and fishers in their community (07). They acknowledged their role as an environmental educator will not be threatened by changing social-ecological conditions, such as human migration, crop viability, and fish abundance, but they expressed a responsibility to "open up [students'] interests and their familiarities with the world … to prepare them for change because the world is going to look really different when they're adults." In acknowledging a link between climate change, loss, and community transformation, this participant echoed sentiments from participants in both regions about the uncertainty of the future, and their capacity to maintain their community or else guide its reconstruction.

Discussion

This study used photovoice to explore how coastal residents in Maine visualized change in their communities. The goals of this study were to understand what different conceptualizations of change were perceived and what those conceptualizations indicate about social-ecological interactions. The results provide evidence for three different conceptualizations of change.

Figure 2.4

Conceptual model of social-ecological interactions

Note. Delta indicates change occurring in one domain; linear arrow indicates interaction between domains; circular arrow indicates adaptation; dotted line indicates change or adaptation is context dependent.
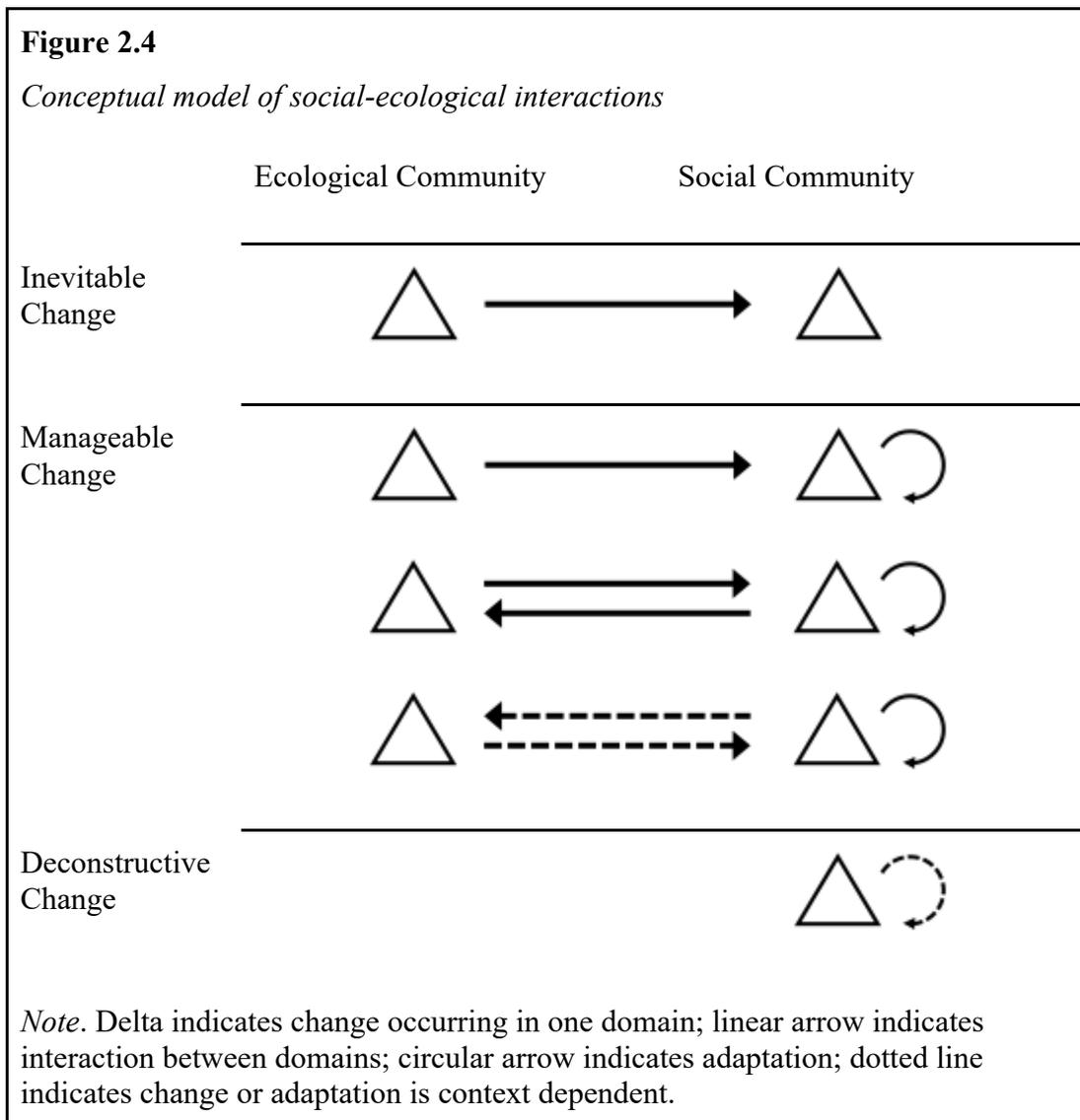
First, participants framed change as an inevitable process defined by predictable cycles that

continually shape the environment regardless of their actions. Second, participants framed change as a manageable process defined by actions to protect the environment and sustain their community through intervention. Third, participants framed change as a deconstructive process defined by actions that contributed to the loss of community identity and hope for reconstruction. Together, these three frames suggest that photovoice participants perceived multiple dynamics of change within the same system, each depending on the focal issue and scale. Each dynamic represents a different organization of social-ecological relationships that encourages participants to "know and do resilience differently" (McGreavy, 2016, p. 105).

When framing change as inevitable, participants described a unidirectional relationship wherein short-term ecological change drives social change with no perceived feedback nor adaptation (Figure 2.4). This frame resembles aspects of "engineering resilience" because ecological change is defined by constancy and recovery (Folke, 2006; Holling, 1996; Powell et al., 2014). Participants suggested that ecological change occurs regularly, often through cycles of recovery and regeneration, which they perceived as an indicator of ecosystem health and stability. Further, they used seasonal ecological recovery as an embodied metaphor to indicate their own need to be resilient. This response to ecological change has been observed in past research (e.g., Bulla & Steelman, 2016; Hatala et al., 2020), and it indicates optimism and acceptance despite a perceived lack of control over the processes driving change (Bulla & Steelman, 2016; Hissa, 2016; Madsen & O'Mullan, 2016). Participants negotiated this tension between agency and acceptance by reframing uncontrollable ecological changes as universal opportunities to build awareness and understanding of the identity and relationships within their community (i.e., "we're all in this together"). In some cases, this awareness helped them identify the interactions between short-term variability (e.g., precipitation) and long-term ecological change (e.g., climate change), but these

examples primarily served to reinforce the perception of community stability and resistance to social change.

When framing change as manageable, participants described multiple relationship dynamics (Figure 2.4). In one dynamic, participants described a unidirectional relationship wherein long-term ecological change drives social change and subsequent adaptation with no perceived feedback (e.g., aquaculture development). In another dynamic, participants described a bidirectional relationship wherein long-term ecological change drives social change and subsequent adaptation as a result of multiple feedback loops (e.g., alewife restoration). In a third dynamic, participants described a bidirectional relationship wherein long-term social change drives ecological change and social adaptation or mitigation with multiple feedback loops as a result of both observed and anticipated future change (e.g., nature preservation). These dynamics resemble "social-ecological resilience" because they define change as a series of interactions, and in some cases feedbacks, that necessitate community adaptation (Folke, 2006; Powell et al., 2014). In particular, they reveal the different ways that individuals and communities reorganized after a social or ecological change threatened social functions, such as natural resource livelihoods, cultural traditions, and public access to nature. By framing change through reorganization and adaptation, participants identified situations where they could leverage their individual and social agency, including supporting the work of community groups and non-governmental organizations. That said, they acknowledged that different priorities may incite conflicts over what decisions are desirable and for whom. To mediate such conflict, participants advocated using historical evidence and community input to avoid unintended consequences of social intervention. In doing so, participants identified social learning and memory storage as adaptive capacities that could facilitate their future resilience (e.g., Carpenter et al., 2001; McGreavy, 2016; Pahl-Wostl, 2009;

Powell et al., 2014). However, participant responses to social-ecological change tended to be framed through adaptation to consequences as opposed to mitigation of causes, which contributed to increased uncertainty over future maintenance and sustainability.

When framing change as deconstructive, participants described the relationship between various social changes, but they did not observe any interaction with ecological change (Figure 2.4). Participants attributed these changes to macroscale processes related to population demographics, economic markets, and governance structures, which they perceived as out of their control. As a result, participants expressed disappointment and distress over loss of cultural history and community identity, which is a response observed in past research (e.g., Bennett & Dearden, 2013). In these cases, participants believed there were opportunities to maintain social relationships and thus community identity but developers and/or managers failed to adequately embrace local concerns. This reflects the aspects of "epistemic resilience," which acknowledges that divergent stakeholder views can incite conflicts that lead to resource dilemmas (Powell et al., 2014). While engineering resilience is reductivist and social-ecological resilience is holistic, neither frame necessitates the community engagement required to negotiate different system interactions, boundaries, and interests (Powell et al., 2014). When using this frame, participants acknowledge that the negative impacts of social change are not distributed equally among community members and suggest that a new form of community may be emerging despite their individual resistance.

Conclusion

Coastal residents conceptualized change as an inevitable, manageable, and deconstructive process. By using these change frames to visualize a variety of social-ecological interactions

within their community, residents frequently engaged in resilience thinking. This connection between social-ecological change and the system's response to change (e.g., resistance, adaptation, incorporation) was unexpected and emergent. It was unexpected because residents were asked to photograph changes that affect their place values, not how the local system responds to such change. It was emergent because residents enacted resilience organically through their discussions about change as a process that includes multiple interactions and feedbacks at different scales. In doing so, residents reconstructed different disciplinary models of resilience, and contextualized the tensions associated with human agency and control over the trajectory of local systems. This suggests that engaging in dialogue about social-ecological change and specifically framing change as a process of interaction may encourage resilience thinking.

Limitations

Before addressing the theoretical and practical implications of this research, there are important limitations to consider. First, while the small sample size generated ample data, additional participants may have helped refine the nuances of the change frames and expand their theoretical generalizability (Larsson, 2009). Second, the amount of time participants engaged their photographs was limited to one photo elicitation interview and one photovoice group discussion. Participants indicated a tension between the intensive time commitment of the project and the desire to engage in further discussion with the other participants in their region. The lack of additional group discussions limited participant contribution to thematic analysis and their ability to member-check the accuracy and resonance of emergent results. Third, the virtual facilitation of interviews and discussion necessitated by COVID-19 may have impacted participant communication and related engagement with the photographs.

Theoretical Implications

As indicated above, photovoice provided valuable insights about community perceptions of social and ecological changes, and the results point to multiple, often contradictory ways participants understand their interactions. In particular, photovoice revealed that participants' acceptance of or resistance to specific changes was due to the perceived agency and power dynamics in their community, a consideration which has been advocated in past research on resilience (Christensen & Krogman, 2012; Cote & Nightingale, 2012; Keck & Sakdapolrak, 2013; McGreavy, 2016; Sinclair et al., 2017). For example, participants tended to accept ecological changes they perceived as uncontrollable and resist social-ecological changes they perceived to be controllable. This reveals an agentic tension between inevitability and manageability, which may indicate the role of psychological distance in framing the drivers of change as exogenous versus endogenous (Spence et al., 2012). Research on psychological distance focuses on how spatial and temporal communication frames impact risk perceptions about environmental change, and studies frequently cite issues of controllability and efficacy as central to understanding community engagement (e.g., Chu & Yang, 2020). While operating under a different epistemological orientation to inquiry, this study contextualizes the relationship between distance and control, and it demonstrates that participants who perceive change drivers as spatially and temporally local also express the desire and capacity to resist such change.

Responding to local change through resistance also has critical implications for understanding and negotiating community power dynamics. In particular, community resistance to change may sustain the status quo. Resilience scholars (e.g., Handmers & Dovers, 1996) and photovoice practitioners (e.g., Wang & Redwood-Jones, 2001), caution against this approach as it may serve to enhance existing power structures and limit openness to alternative actions. However,

in this study, participants' acts of resistance prompted them to evaluate the role of municipal governments and management agencies in contributing to community vulnerability and non-governmental organizations and community groups in responding to those vulnerabilities. In doing so, participants advocated for more community-oriented approaches to management that leverage existing connections and knowledge for future adaptation.

Practical Implications

This research took a descriptive and analytical approach to resilience to understand community adaptation efforts. This is different from the traditional normative and interventionist approaches that evaluate, prescribe, or proscribe specific adaptations (Hamborg et al., 2019). That said, this research has practical implications for engaging community dialogue about management, development, and adaptation. In particular, community perceptions about social-ecological change and related responses are issue and scale dependent. For resilience researchers and photovoice practitioners, this means that if one approach to adaptation engenders community support, it may be opposed when applied to a different issue or even the same issue at a different scale. This highlights the importance of specifying the specific change process or event of interest and exploring the perceived drivers and impacts of such change, including the scalar frames most salient to participants' understanding. Relatedly, photovoice is a reflexive and relational practice that invites participants to identify the past and present conditions that contribute to their sense of community and inform future action. This process is impacted by the photographic medium, which captures a specific moment in time only to be relocated through participant dialogue. As a result, photovoice and related photography may encourage participants to focus on reactive responses that address change impacts rather than proactive plans that mitigate change causes. While

encouraging or evaluating proactive mitigation was not a goal of this research, multiple iterations of photography, reflection, and discussion may have provided an opportunity for participants to extend their considerations from the past and present (i.e., reactive resilience) to the future (i.e., proactive resilience). These practical considerations highlight the critical role of project facilitation, including the specificity of project goals, guidelines for photography practice, and the amount of researcher intervention.

Future Research

This application of photovoice informs future avenues for research. In particular, this study advocates for further consideration of the impact of communication format and duration on participant interactions and contributions. Increasing reliance on mediated communication formats in personal and professional life, particularly video conferencing, increases the opportunities to engage local communities who have internet access (Whitacre & Mills, 2007; ConnectMaine, 2020), but the impact on community research engagement and other outcomes is understudied (Abrams & Gaiser, 2017; Taylor, 2011). Similarly, photovoice practitioners frequently vary the iterations of photography and group discussion to meet research needs, including time constraints and economic resources. In the future, researchers should weigh the opportunities and limitations of various methodological iterations and their impact on participants' ability to integrate and respond to issues as they are co-constructed over time through photography production, content and reception. In more participatory applications, this may mean consulting participants on their preferences for project duration, format, and outcomes. Finally, additional research should address how the change frames explored in this study may map onto other social-ecological changes and community responses, including those anticipated in the future. For example, another photovoice

study could address whether and how communities apply each resilience frame to a specific issue

(e.g., sea level rise), and researchers could compare those framings with a content analysis of news

media or community action plans.

CHAPTER 3

TRACING PHOTOGRAPHIC USE AND MEANING ACROSS PHOTO ELICITATION INTERVIEWS AND PHOTOVOICE GROUP DISCUSSIONS

Introduction

Community-based participatory research on environmental education and management has increasingly integrated visual methods to identify and contextualize community conditions and needs from the perspective of its residents. Photo elicitation interviews and photovoice group discussions are visual methods that use participant-generated photographs as intermediary subjects, narrative anchors, and relational tools to ground participant observations and experiences in the visual culture of everyday life (Collier & Collier, 1986; Mirzoeff, 1998; Wang & Burris, 1997). These methods give participants more control over data collection and interpretation, but they vary in their degree of participant engagement and type of goals. Past research has demonstrated that these methodological differences impact the number of themes and level of detail participants contribute (Kong et al., 2015). Such research prioritizes participant knowledge and meaning as the outcome of visual production, content, and reception but does not often address the process through which participants navigate and negotiate that meaning with the researcher and/or other participants. This study addresses that process of exchange, which permits consideration for the power dynamics and relational politics that shape local knowledge and authority and, in turn, constitute visual culture. In particular, this study traces how participants use photographs to broaden, focus, or shift meaning as a result of material and dialogic exchange. In doing so, it offers theoretical considerations for presentational agency and photographic materiality and practical implications for selecting, designing, and engaging photo elicitation and/or photovoice. The study begins with a brief discussion of photo-sharing as a communication

practice. Next, it introduces photo elicitation and photovoice as separate but related research methodologies that were integrated into a study on social-ecological change. Finally, it presents three exemplar photographs and traces their meaning across different communication contexts.

Communication and photography

Photographs are material, symbolic, and discursive artefacts that serve pragmatic and constitutive communication functions (Pezzullo & Cox, 2018). They can transmit strategic visual messages that document objects or events and persuade attitudes or behaviors; and they can also create a visual culture wherein everyday meaning, values, and relationships are negotiated (Mirzoeff, 1998; Pezzullo & Cox, 2018; Sturken & Cartwright, 2018). Historically, photographs primarily served the pragmatic function of memory until advances in reproduction introduced more opportunities to visually negotiate identity and relationships through photo sharing (Berger, 1972; Mirzoeff, 1998; Van House, 2011). Photo sharing is a dialogic practice that "centers around the encounters, exchanges, and negotiations that happen with, through, and around images" in social contexts (Fairey & Orton, 2019, p. 299). Lobinger (2016) reviewed photo sharing practices and outlined three modes that dictate their use and function: (1) talking about photos, (2) communicating visually, and (3) phatic photo sharing. Talking about photos helps share and build narratives collaboratively. Photographs serve as "conversational resources" and "narrative anchors," which means their materiality is secondary to their relationality (Lobinger, 2016). Communicating visually or "talking with photos" prioritizes the materiality of photographs, a context wherein the informational content and qualities are what is shared. Phatic photo sharing treats photographs neither as narrative anchors nor expressive tools, but as "ritualized exchanges" to maintain interpersonal connection (Lobinger, 2016). These modes are not mutually exclusive;

they are adopted and adapted according to different situations and social demands (Lobinger, 2016). Different communication contexts related to photographic production, content, circulation, and reception impact both the agency of the photographer and the photograph (Rose, 2016). These contexts dictate the power and purpose to (re)present, and they shape how visual culture is pragmatically and/or constitutively engaged (Pezzullo & Cox, 2018; Mirzoeff, 1998; Rose, 2016; Van Dijck, 2008; Van House et al., 2004). This study focuses on the first two modes of photo sharing, including the informational intents (i.e., pragmatic goals) and dialogic impacts (i.e., constitutive practices) of visual communication during a photo elicitation and photovoice study about coastal change.[14]

Photo elicitation

Photo elicitation is a research method that inserts photographs into interviews (Harper, 2002). Collier (1957) developed the method to overcome definitional disagreements in survey categories and tested its efficacy through an experiment that compared the use of verbal questions with photographic probes in interviews. He observed that photo elicitation sharpened participants' memory, reduced their fatigue, increased narrative flexibility, provided more concrete information, and clarified areas of misunderstanding (Collier, 1957). During photo elicitation, photographs serve as intermediary subjects and explicit reference points (Collier, 1957; Collier & Collier, 1986). Participants can expand upon their observations of material content in photographs through spontaneous memory performance and related communication about salient objects, events,

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[14] This study uses "intent" to refer to the meaning a photographer attributed to their photograph through the textual content of their caption, which was the first opportunity to describe the pragmatic goal of their photograph. Defining intent using the photo caption provides an opportunity to explore the instability of intent and how meaning-making can transcend intentionality.

processes, and places (Collier & Collier, 1986). As a result, this method engages the polysemic quality of photographs and enables participants to reveal meanings and interpretations that may be invisible to a researcher (Harper, 2012; Lapenta, 2011). Multiple participant responses can then be compared to identify the different meanings they attribute to the same photograph and thus their "cultural point of view" (Harper, 2012, p. 177).

There are multiple approaches to conducting photo elicitation research (Lapenta, 2011). More traditional approaches rely on photographs sourced from researchers (Harper 2002). However, this top-down approach has been criticized for reasserting the power disparity between the researcher and participant and limiting control over issue representation (Harper 2012; Van Auken et al., 2010). An alternative approach, often termed reflexive photography, sources photographs from participants, redistributing control over the research process and situating photographs more intimately within participants' lived experiences (Harper, 1988, 2012; Lapenta, 2011). Either approach may be applied to individual or group interviews. Collier (1990) notes that group interviewing, in particular, may create competition between participants' perspectives, but the photographs can help direct their responses and in turn reveal useful knowledge about community structures and interactions. The integration of group interviewing and participant-driven photography is the foundation for photovoice, a more recent methodology which increases the emphasis on collaborative knowledge development in the context of community empowerment (Harper, 2012; Lapenta, 2011).

Photovoice

Photovoice is a research methodology that combines participant-driven or reflexive photography and photo elicitation (Harper, 2012; Lapenta, 2011; Latz 2017). Wang and Burris

(1994, 1997) developed photovoice for participatory needs assessment in the context of public health and development. Photovoice aims to build local knowledge, support community collaboration, and catalyze policy action (Wang & Burris, 1997). While similar to photo elicitation, photovoice places a stronger emphasis on community engagement and empowerment, drawing inspiration from critical pedagogy, feminist theory, and nontraditional approaches to documentary photography (Wang & Burris, 1994). Conventional approaches to photovoice invite participants to take photographs that "identify" important social (or ecological) conditions in their everyday life; "contextualize" those photographs through captioning[15] and storytelling in individual or group settings; and "code" the most salient issues, themes, or theories that arise from group dialogue (Evans-Agnew & Rosenberg, 2016; Wang & Burris, 1997).[16] The results of this process are then shared with the wider community, often through a public photo exhibition, to inform policy action. Through this process, photovoice participants may identify individual and shared life conditions and improve their understanding of their control over the changes that impact them (Wang & Burris, 1994, 1997).

Research comparing the differences in participant knowledge acquired from photo elicitation interviews and photovoice group discussions is limited. Kong and colleagues (2015) present one example in the context of land management evaluation that traced the number and quality of themes participants identified in semi-structured interviews, photo elicitation interviews, and photovoice. Their results suggested that photo elicitation interviews provided new themes and

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[15] Captions can be used to prepare for photo elicitation interviews or discussions or to provide context for public photo exhibitions (Evans-Agnew & Rosenberg, 2016).

[16] Photo elicitation and photovoice are often conflated in research. Photo elicitation simply refers to the use of photographs as interview stimuli, and photovoice necessitates group dialogue around participant-generated photographs. As a result, all photovoice studies engage photo elicitation but not all photo elicitation studies engage photovoice.

a higher level of detail than semi-structured interviews and that photovoice group discussions provided the same enhancements, including additional themes not identified during the interviews. In addition, they noted that photovoice increased opportunities for mutual learning among participants (Kong et al., 2015). Whereas their study focused on the total contribution of themes and contextual information added by photo elicitation and photovoice, the present study focuses on their net contribution and considers the ways thematic intent and meaning may change across the individual and group communication contexts. This work supports the proposition that photos serve as material and dialogic sites of learning (Collier & Collier, 1986; Wang & Burris, 1997) and further explores how the perspectives of photographers and audience members are constituted and contested through communication. To that end, this study addresses the following research question: How do photo elicitation interviews and photovoice group discussions impact the use and meaning of participant photographs?

Method

This study combines photo captioning, photo elicitation interviews, and photovoice group discussions, which have all been incorporated into photovoice research (Latz, 2017; Masterson et al., 2018), to understand how different communication contexts shape photographic meaning.

Data Collection and Analysis

I conducted data collection between March 2020 and July 2020 for a photovoice study about the social-ecological changes facing residents in the Bagaduce and Damariscotta River regions in Maine. That study included 10 participants, five from each region, who contributed 193 photographs (range = 9-71) and 166 captions (range = 9-46) in response to two assignments which

asked them to: (1) *Take photos to show what you value about the river and its surrounding communities*, and (2) *Take photos to show what changes affect how you value the river and its surrounding communities*. I invited each participant an orientation meeting in their region (average length = 95 minutes) to discuss the photovoice method, project aims, and photography ethics and safety. I facilitated an in-person orientation for Bagaduce participants and a remote video orientation for Damariscotta participants due to the advent of COVID-19 and related public health guidelines. I granted participants two months to take photographs and subsequently invited them to attend an individual, remote photo elicitation interview (average length = 60 minutes). During the interview, I first asked participants to explain their overall approach to photography for the project and then the way each photograph responded to the assignments. I gave participants freedom to dictate the order and length of photo presentation and discussion and interjected with clarifying questions about recurring issues or themes related to the two assignments. At the conclusion of the interview, I asked participants to select two of their photos, one from each assignment, to share with other participants at their regional group discussion. All but one participant attended the virtual group discussion for their region (average length = 140 minutes). During the group discussion, I presented participant-selected photographs in a random order for each assignment and briefly introduced each with information from its caption. Participants who did not take the photo were then asked to respond to each photo before the photographer was asked to relay the story of their photograph.[17] To compare the intent and meaning of photographs across the captions, interviews, and group discussions, this study focuses on the nine participants who attended the photovoice group discussion and the 18 photographs they selected to present to their

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[17] While facilitators often use mnemonics to prompt discussion, such as SHOWED and PHOTO, there is considerable variation in approaches (e.g., Hergenrather et al., 2009).

regional group after their photo elicitation interview (Figure 3.1). Photo elicitation interviews and photovoice group discussions were recorded and transcribed with permission from participants.

I qualitatively coded the text from photo captions and audio transcriptions from photo elicitation interviews and group discussions following an iterative and inductive process. First-cycle, provisional coding of photo captions provided two coding categories that characterized the values and changes participants ascribed to their photographs (Miles et al., 2014). These provisional categories were based on the photography assignments, and I further contextualized them through descriptive coding, which provided four sub-codes: aesthetic and/or material qualities; spatial and/or temporal locations; individual and/or social connections; and social and/or ecological conditions (Miles et al., 2014). I subsequently applied these categories and emergent subcodes to transcript data from the nine photo elicitation interviews and two group discussions. Second-cycle coding compared the differences across the communication contexts, and I developed two pattern codes to determine whether the meaning of a photograph had broadened or focused (Miles et al., 2014). Broadening indicates the original intent of the photograph (i.e., the content in its caption) was fully engaged, whereas focusing means only part of the original intent was engaged. Pattern coding revealed an additional linkage wherein the meaning of the photo shifted away from the photographer's intent. I incorporated this third pattern code into the final coding scheme and reported it with the results.

Results and Discussion

This section traces how the meaning and use of photographs changed across the communication contexts of photo captions, photo elicitation interviews, and photovoice group discussions. In particular, it presents three exemplar photographs and traces how the meaning of

Table 3

Impacts of interviews and group discussion on photographer intent

Photo ID	Interview impact on caption meaning	Discussion impact on caption meaning	Discussion impact on interview meaning
Bv1	+	◉	◉
Bv2	+	◉	◉
Bv3	+	Δ	Δ
Bv4	+	+	+
Bc1	+	+	+
Bc2	+	+	+
Bc3	◉	◉	Δ
Bc4	+	◉	◉
Dv1	+	+	+
Dv2	+	+	◉
Dv3	+	◉	◉
Dv4	+	Δ	Δ
Dv5	+	Δ	Δ
Dc1	+	+	◉
Dc2	+	+	+
Dc3	Δ	Δ	Δ
Dc4	◉	+	◉
Dc5	Δ	Δ	Δ

Photo ID: Uppercase letter (B, D) indicates Bagaduce or Damariscotta region; lowercase letter (v, c) indicates value or change photo assignment; and number (1-5) indicates group viewing order.
Impacts: Plus sign (+) indicates photo intent was broadened, meaning the original intent was engaged and further contextualized; circled bullet (◉) indicates photo intent was focused, meaning only part of the original intent was engaged and further contextualized; and delta symbol (Δ) indicates photo intent was shifted, meaning the original intent of the photograph was not engaged and a new meaning was contextualized.

those photographs presented in the caption broadened, focused, and/or shifted as a result of interpersonal engagement in the photo elicitation interview and group discussion (Table 3).

Broadening

Broadening means that the intended meaning of the photograph was fully engaged and further contextualized through the photo elicitation interviews and group discussions. Broadening occurred frequently during the interviews (78%) and decreased during the discussion with regards to the caption (44%) and interview (28%) content. There were both material and dialogic factors that contributed to broadening, which will be explored using an example.

Figure 3.1

Bagaduce region photograph entitled "Irony"

A photograph entitled "Irony" depicts a stream that feeds into the Bagaduce River and a sign posted in the foreground (Bc1 in Table 3.1, Figure 3.1). The photographer's caption responds to the change assignment by addressing land management practices:

> 02: This stream flows from a vast heath through a culvert under a road and rushes onward into the Bagaduce. Commendably this area on the roadside has been posted "no spray." However, the blueberry field through which it flows is annually aerially sprayed with pesticides and herbicides – hence the irony.

This caption describes a change in management practices to protect the river. During the photo elicitation interview, the photographer reiterated the content from this caption and provided additional context about their experience with the issue:

> 02: I'm very pleased that this is no spray here, but across the street is something that takes quite a hit. Many years ago, we had the water tested where this brook enters the cove for ... guthion, I think at the time was being used, and I think there's velpar as well now that is used, so hopefully more benign, whatever is being used.

In this case, the photographer broadened the meaning of the photograph by engaging content from the caption, providing spatiotemporal context, describing personal actions, evaluating ecological conditions, and adding the related change of chemical inputs. By talking *about* the photograph in this way, the photographer connected pollution with previous photographs that addressed the historical legacy of agriculture in the community. This type of broadening, which happened without researcher prompting or interjection, was common among participants in both regions.

During the photovoice group discussion, the meaning attributed by the photographer in the caption and interview was further broadened through participant engagement with each other and the material content of the photograph. As with all photographs, I started the discussion by

paraphrasing the values or changes communicated in the caption and subsequently opened the discussion to others:

> Researcher: The changes [02] associated with this photograph were considerations for water quality in the Bagaduce and the types of pesticides or herbicides being used on adjacent blueberry fields. So, how might others respond to this in terms of change?
>
> 03: Can I ask what the sign means?
>
> Researcher: No spray. Correct?
>
> 02: Yes, the landowner may request that from the [Department of Transportation], so that roadside spraying can be avoided in those areas which are designated by the landowner. So this was a section of road that has a no spray sign posted on it.

In this case, the sign depicted in the photograph functioned as a tangible entry point into discussion and prompted a brief question-answer exchange, to which the participant responded:

> 03: … One of the things I love about here versus other places I've lived is that you can be so trusting with the water. I wouldn't think twice about wading in anywhere, but yeah that sign and that sentiment serve as a reminder that we haven't totally come to an agreement as a community about how to take care of the land while having it still be productive, commercially productive.

By engaging with the meaning of the sign, the participant constructed a tension between safety and uncertainty, which prompted others to respond in kind:

> 01: I agree. I think the picture is very clear … you know, no spray, and this is why. It shows responsibility.
>
> 05: Yeah, I also find that learning that the NS is no spray and at the land owner's request scares me, because the Bagaduce watershed is the entire watershed ... I would love it if all

of the watershed were protected against spraying. ... It would be wonderful to have a little

bit better enforcement. But in addition to enforcement, the better thing is education.

Here, participants highlighted the relationship between water quality, responsibility, and action,

which support the meanings attributed to the photograph in the caption and interview. In response

to this discussion, the photographer read the caption, reiterated their past experience with water

quality testing, and added additional context about their concern for impacts on wildlife.

This example demonstrates the potential for both the photo elicitation interview and

photovoice group discussion to broaden the meaning of a photograph with limited intervention

from the researcher. In particular it reveals how the material content of a photograph may be used

differently across each context. During the interview, the photographer used the material content

to set the scene, but it was secondary to their meaning-making. During the discussion, the material

content of the photograph was of primary importance as it literally and figuratively focused

participants' attention. The specificity afforded by the sign enabled participants to successfully

read into the meaning of the photograph and attach their own experiences and desires through

broadening.

Focusing

Another impact of the photo elicitation interviews and photovoice group discussions was

to focus the meaning of a photograph. Focusing means that only part of the intended meaning was

engaged and further contextualized. Focusing occurred infrequently during the interviews (11%)

and increased during the discussion with regards to the caption (28%) and interview (39%) content.

Again, there were both material and dialogic factors contributing to this impact, which are explored

through an example.

Figure 3.2

Bagaduce region photograph entitled "Ice Out"

A photograph entitled "Ice Out" depicts fishing shacks and coastal houses separated by the ice-covered Bagaduce River (Bc3 in Table 1.3, Figure 3.2). The photographer's caption responds to the change assignment by addressing multiple seasonal experiences:

> 01: As sure as fresh smelts curl in the frying pan, winter marks the return of smelt shacks to the Upper Bagaduce. Locals will dig out their smelt houses, pull them upriver and stake them into the ice, following instinct as well as the river's channel. ... In recent years, and to the chagrin of fishermen, there has been a hubbub of sorts with requests being made that these shacks be painted uniformly, face the same direction and generally be kept better.

This caption describes a change in season, which facilitates a further change in recreation opportunities and introduces occasional conflict. During the photo elicitation interview, the photographer introduced the photograph by locating it and reiterating the conflict presented in their caption:

01: It comes out to a point … and you can see there's some houses. It's almost like a face

off ... and not in recent years but in the past, there's been a little to do about the people

from the opposite side not really wanting to look at these smelt houses … it's been a little

ridiculous actually.

Here, the participant uses the composition of the photograph to describe the separation of different

resident groups. This conflict between long-term and short-term residents was described in

previous photographs, and to explore this connection, I asked about the frequency of related

events:

Researcher: You had said that new people move in and some of them make claims about

things that they do or don't care about. Is that something itself that has changed or trended

in one way or another over time?

01: It just kind of goes away … and we, the locals, still continue to put out smelt houses

… I think it builds and builds and builds … and then of course if there's someone that

wants to do something on the river with aquaculture, then it's an explosion again … but

we just try to stay out of that conversation.

In this case, the photographer focused the meaning of the photograph by engaging content from

the caption that addressed past events of conflict, rather than incorporating the broader seasonal

changes associated with ice coverage and smelt fishing. My interjection prompted the participant

to provide more spatiotemporal context, which helped distinguish the different groups of residents

and connect this change with others occurring locally. As a result, the interview revealed the

material and emotional salience of conflict not emphasized in the caption. This type of focusing

was not common within interviews, and it only occurred with one other participant.

During the photovoice group discussion the meaning attributed by the photographer in the caption was focused through participant engagement with the photograph. After the I introduced the photograph, participants responded without being prompted:

Researcher: The change that's associated here is the seasonal arrival of the smelt shacks, their removal during ice out, and then in recent history, a little bit of pushback about the color of the structures themselves. So, let's hear from others about changes you might personally associate with this.

02: I love seeing this, and what I see here that is so wonderful is no change because these ice shacks have been a feature of the river for so long and even this winter the fishery was healthy … I had actually noted in a photo that I took when the ice starts to soften up, then everybody who has a shack on the river is pulling them into shore. … so it's a change, but it's one that's encouraging.

03: This photo has a really timeless quality to it. Also, as someone who didn't grow up in this landscape ... ice fishing is something I didn't know about. So when I first saw houses out on ice, I was like why, what are people doing and at that time of year. ... It's just another marker of the season, and this captures that transition really beautifully.

05: I really liked the fish shacks because I grew up in northern Maine where I would go ice fishing with my father on the lake ... And now when we came here and we saw fish shacks on the river again, it made us feel very much at home. Every winter we look for them ... and we can kind of take measure with those in terms of how good the fishing is or how interested the local people are in fishing for them.

This exchange centers around the community tradition of smelt fishing, and participants connected to it through memory performance. While participants do not engage each other directly, their

responses build a positive, supportive, and nostalgic narrative that defines their experience of community. In response to this discussion, the photographer read the caption, affirmed participant responses, and clarified the meanings that were not addressed by the group:

> 01: So, this is a huge part of our family, obviously we participate in the smelt shacks. So I was just trying to show the tradition like [02] said ... but then I also thought it was interesting how there was a little bit of a divide shown there between the ice shacks on our shore. And then if you look across … those are bigger houses, possibly of people that have moved in who are now making these requests to do things a certain way. And so this is a change that's not so nice for the locals. But yeah, it's also a change of seasons. It's a positive, the season is a very positive thing locally. Lots of children have learned how to ice skate outside those ice shacks, mine included.

The photographer's response to the group discussion acknowledges the dual intent of the photograph but quickly shifts from conflict back to the positivity associated with the community tradition. In turn, the other participants offered support, suggesting the fishing shacks "show the freedom of individuality" and characterizing the related conflict as "bizarre."

This example demonstrates the potential for the photo elicitation interview and photovoice group discussion to focus meaning in different ways. The interview presented an opportunity for the photographer to talk *with* the photograph, prioritizing its material content to emphasize conflict as a separation between resident groups. The interview also offered me an opportunity to interject with questions about how the photograph connects with other photographs or narratives previously described. The group discussion presented an opportunity for participants to talk *about* the photograph, prioritizing personal narratives over material content. In this case, participants did not engage each other's responses directly, which may suggest the importance of material content in

facilitating a more interactive dialogue. In addition, by not reading into the material composition of the photograph as intended, participants missed an opportunity to engage and incorporate similar experiences of community conflict. This may indicate the difficulty associated with discussing conflict in a group discussion, versus an individual interview, as well as seeing and attending to multiple photograph meanings, particularly when they are represented subtlety or abstractly.

Shifting

The final impact of the interview and discussion was to shift the meaning of a photograph. This meant that the original intent of a photograph was not engaged, and a new meaning that was not previously discussed was contextualized through the different communication contexts. Similar to focusing, shifting occurred infrequently during the interviews (11%) and increased during the discussion with regards to the caption (28%) and interview (33%) content. The material and dialogic factors related to shifting are explored in a final example.

A photograph entitled "Late Spring – Looking Toward Damariscotta" depicts oyster aquaculture floats adjacent to the photographer's property (Dc3 in Table 3.1, Figure 3.3). This photograph and others by the participant present a cohesive narrative about the perceived impact of aquaculture on landowners, and the caption of this photograph responds to the change assignment by specifically addressing aquaculture management:

> 06: An increasing number of oyster leases stretch from in front of our property up river toward town. Contrary to preceding years' practices, there was no hearing prior to the Maine Department of Marine Resources granting an automatic 25% increase in lease size

this year. … We have repeatedly asked when hearings were held how many acres of oyster

leases the river can sustain safely. … We have never been given an answer.

Figure 3.3

Damariscotta region photograph entitled "Late Spring – Looking Toward Damariscotta"

This caption described a change in the number of oyster leases and the governance processes that

manage them. During the photo elicitation interview, the photographer described the relationship

between this image and its pair (Dv3), which depicted the same view before the seasonal oyster

floats are installed:

06: You're seeing this to get those consistent comparison points … And I picked this one because you could see them up closer and they're standing more to the right, but you can see looking down all of that stuff in the river.

Researcher: So, how has this change been affecting the value of that space for you?

06: You can't access our back cove at all. … You can't water ski across here. You can't even take a kayak through there. Doesn't that look kind of like those pictures of D-day, where you look out off the French coast and there's the whole allied armada ready to attack.

In this case, the photographer shifts the meaning of the photograph from the number of oyster floats and related management processes to recreational access and frames the material content as a conflict by comparing the oyster floats to opposing forces in a war. This shift in meaning may have been due to the photographer's use of previous photographs to discuss the issues addressed in the caption, and/or it may have been prompted by my interjection about the relationship between value and change. This type of shifting was not common within interviews, and it only occurred with one other participant who also organized their photographs around a cohesive narrative.

During the photovoice group discussion, the meaning attributed by the photographer in the caption and interview further shifted through material and dialogic engagement. After I introduced the photograph, participants drew attention to the material content of the photograph:

09: Well this is a really big change. We once saw ships coming up the river, and now we see oyster farming. And it takes up space and is visual … and most importantly, it's an occupation for lots of people, so it certainly changed that means that the river isn't as pristine in certain ways … [but] this change seems really good to me.

10: I don't think we see them in the winter, right? Don't they get submerged?

06: They get taken in. … In that earlier picture, they had not been there.

These responses prompted the other participants to engage similar ideas about seasonal change and the impact of the aquaculture industry:

> 08: I would say this also makes me think of seasonal changes. … Bringing the cages back out signals a period of rebirth and growth, new life starting on the river. And it's really an interesting way to mark the changes of seasons by the changes of activity that's happening on the farm.
>
> Researcher: And then, [07].
>
> 07: Yeah, I think for me it just represents how much humans can change the environment, you know, whether it's for good purposes or bad purposes.

In this case, participants shifted the discussion away from the original meanings ascribed to the photograph by contextualizing the seasonal and historical importance of the aquaculture industry. In response, the photographer weighed the positive contributions of the industry identified by participants and the negative impacts they described in their caption and interview while acknowledging that their concerns do not extend to all aquaculture operations. In doing so, they engaged participants through rhetorical questions ("Where is the balance? Where's the stopping point?") and calls to material content ("Do you see how far it stretches off into the horizon?"). This response engendered support from one participant who validated their questions, created tension with another participant who was employed by the aquaculture industry, and facilitated further group discussion about the relationship between development, governance, and property ownership that the group discussed in previous photographs. Importantly, this supplemental discussion and tension also prompted a different participant to ask a question, which further shifted the meaning and use of the photograph:

09: And what is special about your part of the river that makes it so appealing for these leases?

06: Oh, it's a couple things. It's the right blend of saltwater and freshwater coming in, There's a stream … that gives you that little bit of extra fresh water content. What for me is phenomenal is when you see the deterioration of the ancient oyster shells … providing the nutrients to the shells for these new oysters. Isn't it awesome? [08], is that really true? That's what I've always figured.

08: It is certainly helpful. The ocean is super saturated in calcium, so it's available to the oysters anyway. That particular area has a very high water temperature. Everywhere [near there] has a very high water temperature and oysters growth is directly related to water temperature, so all of the farms have their seed growth areas as close to town as possible, where the water is warmer.

Here, a question tempered the tension by reorienting the discussion to the biophysical qualities of the environment depicted in the photograph. In doing so, it also shifted the relationship between the photographer and industry representative away from being adversarial and offered an opportunity for mutual learning.[18]

This example demonstrates the potential for the photo elicitation interview and group discussion to shift meaning in different ways. The interview presented an opportunity for the photographer to shift the meaning of the photograph as a result of its material content, previous discussions, and interactions with me. The group discussion offered participants the opportunity

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[18] In a subsequent interview to evaluate the project (Chapter 4), the industry representative noted that the exchange would have been more "comfortable" if they had a "head's up" about the potential for conflict, and suggested they may have selected different photographs as a result. Another participant suggested they "felt badly" that the exchange was "tense" but that it also reflected the "difficult conversations" happening in their community.

to switch between talking *with* and *about* the photograph, which facilitated an interactive dialogue where participants engaged with each other directly by augmenting observations, asking questions, and providing responses. This impacted the photographer's control over the narrative of the photograph, created tension between different personal experiences, and inspired a productive shift in meaning-making that offered dialogic space for the renegotiation of knowledge and relationships.

Limitations

While the results provide valuable insights about the material and dialogic factors shaping photovoice, this study is not without limitations. First, the majority of the study was conducted and facilitated through online, synchronous video conferencing due to COVID-19. This differs from traditional applications of photovoice conducted in-person and face-to-face, which may impact participant communication and interaction as a result of differences in nonverbal cues, eye contact, turn-taking, self-presentation, and external distractions (e.g., Abrams & Gaiser, 2017; Taylor, 2011). Second, the study incorporated only one iteration of photography, photo elicitation interviews, and photovoice group discussions. Multiple iterations of each practice may have provided more opportunities for participants to identify new photographic uses or meanings, tailor their visual narrative to their group, and build rapport with each other. In addition, public photo exhibitions, events to share the participants' photographs with the broader community, are routinely incorporated in photovoice research, and they present a different communication context that can impact the negotiation of meaning, which was not explored. Third, I served as the sole coder of qualitative data, and the dependability of the results may have been improved through the

addition of multiple coders and participant member-checking (Lincoln & Guba, 1985, 2013).[19] To ensure the dependability of the results despite these omissions, I focused their interpretation of captions and transcripts on the topics of the photograph assignments (i.e., value and change) and frequently shared coding tensions and questions with a colleague as they emerged.

Implications

When designing a photovoice study, researchers should consider the impacts of methodological choices on presentational agency, the role of the facilitator, and photographic meaning. Interviews provide photographers with agency over the meaning and use of their photographs. This can encourage them to broaden the meaning of the photograph by identifying and contextualizing connections to different photographs or experiences. This can also increase the need for the researcher to refocus discussion around their photographic intent and/or the assignment. Group discussions, in comparison, may limit photographer agency, present photographs out of context, and provide other participants with opportunities to co-opt the meaning of a photograph. This negotiation can encourage participants to focus or shift the meaning of a photograph and increase the need for the researcher to manage the dominance of certain perspectives. Whether using interviews or discussions, photovoice researchers must also consider who has control over the presentational order and format. Because interviews only focus on the photographer's perspective, they offer an ideal opportunity to grant participants more presentational control, especially if their photographs have a deliberate order or relationship to each other. Group discussions, however, can present more challenges navigating different

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[19] There is a lack of clarity surrounding photovoice analytical procedures (Latz, 2017). As a result, the integration of multiple coders and member-checking is inconsistent across applications (e.g., Hergenrather et al., 2009).

perspectives, turn-taking, and time constraints. In this case, it may benefit the researcher to determine presentational order and format or consult participants for their preference ahead of time (Chess & Purcell, 1999; McComas et al., 2010; Sunwolf & Seibold, 1999). That said, each decision may further impact the agency of the photographer. For example, in this study, the photographer was asked to speak last, which not only offered them the opportunity to see whether or not their original intent was engaged, but also impacted their own engagement with the photograph, including downplaying or defending the original intent. Finally, researchers should consider potential interactions between multiple methods. For example, participants in this study captioned their photographs with the knowledge of future opportunities to contextualize their observations through the interview. This may have impacted the amount of information they provided in their caption, contributed to broadening, and/or indicated a preference for discussion over annotation (Van House et al., 2004). Similarly, participants produced their photographs with knowledge that some would be shared with their regional group, which may have impacted their framing and selection. For example, during one photo elicitation interview in the Bagaduce region, a participant offered a photograph of marine debris they intended to share with the group but expressed hesitancy due to its potential to incite conflict with another participant. That photo was not shared with the group, which again points to the importance of iterative opportunities to share photos and build trust among participants.

Researchers should also consider the different ways that participants or participant groups invite their own approaches to photography and discussion into photovoice. Interviews provided an opportunity for participants to explain their individual approach to photography, which not only influenced how they responded to the photo assignments but also how much detail they provided about the decisions and meanings behind each photograph (Bendell & Sylvestre, 2017). In this

study, for instance, participants in the Damariscotta region tended to take a deliberate approach to photography, strategically producing and organizing their photographs to communicate a cohesive narrative about a specific issue or location. In contrast, participants in the Bagaduce region tended to take a more exploratory approach, spontaneously producing and organizing their photographs in response to the sights/sites that inspired them. These approaches impacted the flexibility of the interview, including participants' openness to repeat information they had previously discussed and explore unanticipated ideas or questions emanating from their photographs (Collier & Collier, 1986; Harper, 2012).

In addition, these approaches may have impacted the group discussion, including whether participants broadened, focused, or shifted the meaning of a photograph and how photographers responded to others' interpretations. In this study, participants in both regions engaged in broadening, focusing, and shifting; however, there were important differences. Participants in the Damariscotta region tended to broaden the meaning of a photograph by adding critical socio-historical context, whereas participants in the Bagaduce region often did so through supportive personal anecdotes. Similarly, Damariscotta region participants tended to shift meaning more than Bagaduce region participants, who tended to engage in more focusing. This resulted in more dialogic tension between participants in the Damariscotta, but it also offered more diverse perspectives. These regional differences suggest that the groups may share their own visual culture (Hansen & Machin, 2013; Mirzoeff, 1998), which impacted the way they attended to the material and dialogic similarities and differences in constructing their experience of community amid change.

Different research decisions and participant approaches influence whether or not participants' views are validated or negotiated through communication. When analyzing

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photovoice results, researchers therefore need to address the interaction between communication intents (i.e., pragmatic goals) and impacts (i.e., constitutive practices; Pezzullo & Cox, 2018). Wang and Burris (1994, 1997) specify both pragmatic and constitutive goals of photovoice, including the pragmatic documentation of community conditions and constitutive production of local knowledge through critical dialogue; however, photovoice researchers tend to focus their results on the pragmatic goals by responding to the research questions and photography assignments, often determined by the researcher, and reporting the total contribution of themes (e.g., Kong et al., 2015). In doing so, researchers often diminish the role of material and dialogic interaction in negotiating the visibility of community issues (Rose & Tolia-Kelly, 2012). By focusing on the constitutive means of communication, in addition to its pragmatic ends, researchers can directly attend to the critical-constructivist orientation of photovoice and gain access to the politics of photography related to individual and social processes of construction and contention. This includes considerations for how the visual and material are co-constituted through participant-researcher and participant-participant relationships (Lobinger, 2016; Rose & Tolia-Kelly, 2012).

Together, these implications for methodological design, participant dynamics, and constitutive communication practices outline the relative affordances and constraints of photo elicitation interviews and group discussions, and they offer considerations for which method may be best suited for different research contexts and questions. In summary, interviews tend to broaden photographic meaning because they contribute more presentational agency, prioritize talking *about* photographs, and reveal connections between photographs. Discussions, however, focus and shift photographic meaning because they contribute less presentational agency, prioritize talking *with* photographs, and reveal connections between participants. Therefore, research focusing on documenting the sheer diversity of community conditions and issues may prioritize

conducting interviews, whereas research focusing on issue salience and negotiation may focus on group discussions.[20]

Conclusion

Photovoice research has prioritized the verbal and textual content of photo elicitation interviews and group discussions, which has diminished the material importance of photographic content in facilitating dialogue. This lack of consideration for the relationship between materiality and discursivity of photographs has critical implications for photographic use and meaning-making in individual and social communication contexts. This study addressed these considerations while honoring both the pragmatic and constitutive functions of photovoice (Pezzullo & Cox, 2018; Wang & Burris, 1997). In doing so, it directly engages the critical issues of representational agency and power that are foundational to photovoice and centers them within dialogic practices that broaden, focus, and shift photographic meaning.

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[20] While not the focus of this study, photovoice may also provide opportunities for phatic photo sharing if participants build relationships with other participants or community members outside of project meetings. Photo circulation on social media may encourage this practice, and it has been integrated into past photovoice research (e.g., Cai, 2020).

CHAPTER 4

USING Q METHOD TO EVALUATE THE VISUAL LITERACY PRACTICES

ENGAGED IN A PHOTOVOICE PROJECT

Introduction

Participatory research methods are designed to give community members more control over the construction, representation, and application of local knowledge. Many of these methods, such as photovoice, add critical and emancipatory aims, meaning they seek to empower community members to reflect on the sociopolitical structures and environmental conditions that impact them and use that knowledge to organize action that improves their community experience (e.g., Wang & Burris, 1997). Despite these aims, past research has demonstrated that photovoice applications do not often seek nor attain action-oriented outcomes and practitioners suggest that community action is not necessary for the method to make a positive impact on participants (e.g., Catalani & Minkler, 2010; Derr & Simons, 2020; Latz, 2012). In turn, research calls for practitioners to be more explicit about their approach and intended goals so that research can be adequately evaluated and adapted in different contexts. Acknowledging the difficulty in attending to this action-orientation, this study evaluates alternative benefits for community members engaged in a photovoice research project. It uses Q method as a participatory evaluation tool and visual literacy as a theoretical framework to understand what visual learning and communication practices participants engaged through photovoice and how those practices influenced participants' assessment of its (non-action-oriented) methodological goals, including to record community conditions and promote local knowledge through critical dialogue. The results offer theoretical implications for understanding photovoice as a critical and reflexive practice and practical implications for adapting photovoice project structure to accommodate individual and

social commitments. The study begins with a review of visual literacy as a multidimensional concept and practice. Next, it demonstrates why the theoretical and practical connections between visual literacy and photovoice goals can aid methodological assessment. Then, it explains how the assessment was applied to understand perceived visual literacy engagement. Finally, it presents two perspectives that summarize the individual and social affordances of community engagement with photovoice.

Visual Literacy

Visual literacy is a multidisciplinary concept comprising the production, reception, and dissemination of images (Rose, 2016; Serafini, 2017). While the use of images in education predates classical antiquity, it was not until the mid-twentieth century that investigating their role in education was formalized in art and media studies (Avgerinou & Pettersson, 2020; Davis, 1939; Peña Alonso, 2018). The concept was first defined and widely popularized by John Debes (1969), who shared public concerns over the impact of television on children. His well-cited definition extended the focus of existing literacy education from verbal or textual to visual language (Debes, 1969).[21] In the following decades, scholars debated the definition, including the contradictions associated with "reading" and "writing" images, and its relation to other literacies, such as information, media, and digital literacy (Avgerinou & Pettersson, 2020; Elkins, 2008; Messaris, 1994; Serafini, 2017). These debates focused on disciplinary functions of visual literacy and

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[21] Debes (1969) defined visual literacy as: "A group of vision competencies that a human being can develop by seeing and at the same time having and integrating other sensory experiences. The development of these competencies is fundamental to normal human learning. When these competencies are developed, they enable a visually literate person to discriminate and interpret the visible actions, objects, symbols, natural or man-made, that he encounters in his environment. Through the creative use of these competencies, he is able to communicate with others. Through the appreciative use of these competencies, he is able to comprehend and enjoy the masterworks of visual communication" (p.27).

impeded the formulation of a cohesive definition (Avgerinou & Pettersson, 2020; Brill, Kim, & Branch, 2007; Seels, 1994). In lieu of a definition, scholars offered broad theoretical frameworks and taxonomies to consolidate various visual literacy skills (Avgerinou & Pettersson 2011, 2020; Seels, 1994). For example, the "visual trinity" framework comprises visual thinking, learning, and communication (Avgerinou & Pettersson, 2020; Randhawa & Coffman, 1978; Trumbo, 1999). Avgerinou and Pettersson (2020) describe visual thinking as a "fusion of perception and conception," which facilitates image visualization (mental imaging) and creative expression — prerequisites for visual learning and communication (p. 448). Visual learning and communication, often equated with "reading" and "writing" images, include various dimensions of image interpretation, design, and use (Avgerinou and Pettersson, 2020; Trumbo, 1999). To help operationalize these frameworks, scholars, such as Kędra (2018), have produced thematic lists of skills to be used as a "basis for defining learning objectives in visual education, or for creating a method of [visual literacy] assessment" (p. 82).

Recent assessments of visual literacy in higher education suggest students lack key skills despite increased exposure to visuals in digital and online environments (Brumberger, 2011; Matusiak et al., 2019). Matusiak and colleagues (2019) suggest this is, in part, due to instructor and peer expectations that do not explicitly encourage the integration of visuals in traditional activities and assignments, such as papers. Consequently, researchers and educators have advocated for and developed new instructional opportunities, tools, and rubrics that scaffold traditional efforts to understand and use visuals in higher education, including "one-shot" library instruction sessions about finding, evaluating, and citing sources (Arneson & Offerdahl, 2018; Blummer, 2015; Bowen, 2017; Harris, 2010; Milbourn, 2013; Schoen, 2015). To support the increased development and assessment of visual literacy skills, and to complement existing

information literacy efforts, the Association of College and Research Libraries proposed the most comprehensive set of visual literacy skills to date (ACRL, 2011, 2016; Thompson & Beene, 2020). Their "Visual Literacy Competency Standards for Higher Education" propose seven core standards related to the identification, interpretation, evaluation, use, and creation of images, each with their own performance indicators and learning outcomes (ACRL, 2011). Since their inception, the standards have been referenced and applied in empirical research, pedagogical case studies, and theoretical articles, particularly in the education and library science disciplines (Brumberger, 2019; Thompson & Beene, 2020).

While commendable efforts have been made to unite the disparate field of visual literacy, scholars increasingly acknowledge the need to extend visual literacy education beyond academic institutions and into the public sphere, where visuals are not isolated from the sociocultural and technological contexts of their production (Brumberger, 2019; Dallow, 2008; Serafini, 2017). This means embedding visual literacy education within the broader experience of visual culture and shifting its aim from competency and compliance to empowerment and resistance (Avgerinou & Pettersson, 2020; ACRL; 2016; Mirzoeff, 1998; Pauwels, 2008; Sturken & Cartwright, 2018). In other words, the static and functional definitions of visual literacy may actually limit opportunities to critically "negotiate or 'navigate' … the visual as an interface or cultural zone of social exchange" where meaning is collaboratively constructed and contested (Dallow, 2008, p. 98). As a relational practice, visual literacy should therefore encourage critical and reflexive thinking about how to "read" (interpret) the power dynamics in visual constructions of the self, other, and environment and empower individuals to intervene in visual culture by "writing" (creating) their own vision (Avgerinou & Pettersson, 2020; Barreto, 2006; Dallow, 2008; Jacobson & Mackey, 2013). This paradigm shift from pragmatic "learning goals" to constitutive "knowledge practices"

and "dispositions" offers more flexibility for individual growth and community learning in a complex and ever-changing visual culture (ACRL, 2016).[22]

Theoretical Framework. This study applies a theoretical framework that integrates visual learning ("reading") and communication ("writing") practices to assess different levels of participant engagement in photo-based research. It operationalizes visual literacy practices using a hierarchy of skills identified in past research (Table 4.1). The visual learning skills assessed include the identification, interpretation, comprehension, and evaluation of photographs, and the visual communication skills assessed include the creation and use of photographs. Following more critical-constructivist critiques of visual literacy as a benchmark for educational attainment, this study positions visual learning and communication as dynamic and relational practices engaged in everyday life and explores how they are influenced by research participation. In doing so, this study supports existing research about the tensions between visibility (i.e., the capacity to be seen) and visuality (i.e., vision as a social construction) and investigates the role of visual learning and communication in navigating those tensions (see chapter 1).

Photovoice

Photovoice is a community-based participatory research methodology that engages participants in visual thinking, learning, and communicating through individual photography assignments and group discussion. Wang and Burris (1994, 1997) designed the method to assess

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[22] The "Information Literacy Competency Standards for Higher Education" were created by ACRL in 2000 and rescinded in 2016. That year, the ACRL replaced "the Standards" with the "Framework for Information Literacy for Higher Education," which emphasized theoretical concepts over prescriptive standards to provide flexibility and help address socio-technological developments. The "Visual Literacy Competency Standards for Higher Education" were created by ACRL in 2011 and adapted in the 2016 book "Visual Literacy for Libraries: A Practical, Standards-based Guide" to help integrate visual literacy education with "the Framework" (Thompson & Beene, 2020).

community needs from the perspective of its residents, and they drew inspiration from constructivist orientations in critical pedagogy, feminist research, and documentary photography (Wang & Burris, 1994). Drawing centrally on critical educator and theorist Paulo Freire, photovoice is a form of problem-posing education that uses photographs as contextual "codes" to problematize everyday social and political forces that influence a community (Freire 1970/2005; Wang & Burris, 1997). Through critical reflection and discussion of photographs directed at community conditions, photovoice aims to enhance individual beliefs in and control over the changes in their life, which Freire refers to as "critical consciousness" (Freire 1970/2005, 1974/2005; Wang & Burris, 1997). Drawing additionally on participatory feminist research, photovoice intends to challenge normative and prescriptive ideas about what constitutes salient knowledge and expertise and aims to empower suppressed voices and visions (Maguire, 1987; Wang & Burris, 1994, 1997). Finally, drawing on a model for documentary photography employed by professional photographers (Ewald, 1985; Hubbard, 1991), health researchers (Roter et al., 1981; Rudd & Comings, 1994), and educators (NFIE, 1983), photovoice advocates for self-representation, such that individuals "may record and catalyze change in their communities, rather than stand as passive subjects of other people's intentions and images" (Wang & Burris, 1997, p. 371).[23]

Photovoice participants are typically involved in a three-stage process that includes taking and selecting photos that best reflect their community; contextualizing them through personal stories exchanged in a small or large group setting; and identifying the primary issues or themes

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[23] Photovoice has roots in literacy education, but Wang and Burris (1997) would not advocate for participants to attain a normative level of literacy through project participation. In fact, they reconceptualized the method from "photonovella" to differentiate it from literacy education, arguing literacy is not required for knowledge production and empowerment.

that emerge from discussion (Wang & Burris, 1997). Through this process, the method should: (1) record and reflect community conditions, (2) promote critical dialogue and local knowledge through discussion, and (3) reach policymakers (Wang & Burris, 1997). This process and set of goals have guided photovoice research in many contexts, including public health (e.g., Catalani & Minkler, 2010), education (e.g., Latz, 2017), and the natural environment (e.g., Derr & Simons, 2020). However, across these studies, photovoice goals are not always interpreted nor applied in the same way. For example, many adaptations of photovoice broaden the policy directive to include other forms of community action, which may or may not involve policymakers, such as public photo exhibitions, informational campaigns, and organization development (Catalani & Minkler, 2010; Lofton & Grant, 2021).

Meta-analyses reveal that the extent to which photovoice projects attain these goals, particularly the policy directive, is dependent on the level of participation by community members and theoretical orientation of research (Catalani & Minkler, 2010; Derr & Simons, 2020). In a review of photovoice applications in public health, Catalini and Minkler (2010) defined level of participation qualitatively as duration of researcher-community relationships; intensity of training to build community capacity; iterations of photography and dialogue; and opportunities for action and advocacy. In a review of photovoice in environmental education contexts, Derr and Simons (2020) found that photovoice projects focusing on conservation engaged decision-makers (e.g., local officials, resource managers) more frequently than in other applications, such as place-based pedagogy, where education is the primary aim. Acknowledging the different needs and constraints of photovoice applications, these studies support a growing call for practitioners to be more explicit about their approach and intended goals, whether or not they are aligned with the original conceptualization of the method. For example, Latz (2012) acknowledges the difficulty in attaining

emancipatory or action-oriented outcomes in some photovoice applications and offers "reflective consciousness building" as a valuable alternative (p. 59). This alternative positions inquiry as a source of "self-authorship," facilitating internal coordination and definition of personal beliefs, values, and loyalties, rather than external advocacy for larger socio-structural change (Latz, 2012).

Study Background

More intentional research design improves researcher capacity to target and evaluate specific photovoice outcomes. Strack and colleagues (2010) offer a social-ecological logic model to support this effort, distinguishing outcomes across individual, interpersonal, and community levels. However, formal evaluations of photovoice projects, particularly at the community level, are still rare, and goal attainment is often implied rather than substantiated (Catalani & Minkler, 2010; Derr & Simons, 2020; Fantini, 2017; Lofton & Grant, 2021). This is particularly true for the first two goals identified by Wang and Burris (1994, 1997). To that end, this study evaluates the degree to which participants in a photovoice project felt they (1) identified community conditions and (2) constructed knowledge through individual reflection and critical dialogue with others — practices regularly attributed to visual literacy education.

The photovoice project explored how social-ecological changes in two coastal estuaries in Maine impacted residents' assessment of place value. Some changes facing residents included amenity migration, habitat degradation, traditional fisheries decline, marine aquaculture development, and sea-level rise, which can incite conflicts over different uses and value systems (Hanes, 2018; Johnson, 2020; McGreavy et al., 2018). Photovoice participants attended a project

orientation, identified and photographed community conditions in response to two prompts,[24] discussed their photographs in an individual interview, and shared two representative photographs during a group discussion with other participants in their region. The emergence of COVID-19 necessitated a shift in project facilitation from in-person to online, which had significant implications for participant engagement, as will be explored. The project goals were communicated with participants throughout each step of the process, and while pitched as a means to advocate for individual and community well-being, there was no intention to reach policy makers or develop an action plan.

Visual literacy was used as a theoretical framework to ground participant engagement in interpreting ("reading") local conditions through photographs and creating and communicating ("writing") their narratives across individual, social, and environmental contexts. In other words, the photovoice method and goals offer an opportunity to practice visual literacy skills while navigating community change in everyday life. Focusing then on the influence of visual literacy practices on photovoice goal attainment, I ask the following research questions:

RQ1.   What visual literacy skills do participants report they engaged through photovoice?

RQ2.   How does visual literacy engagement influence participant assessment of the photovoice project?

Method

Q methodology integrates quantitative and qualitative approaches to compare the subjectivities about an issue (Brown, 1980; Watts & Stenner, 2012). It is an exploratory process

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[24] Photovoice participants were asked to respond to the following prompts: (1) *Take photos to show what you value about the river and its surrounding communities*, and (2) *Take photos to show changes that affect how you value the river and its surrounding communities*.

wherein participants model their perspectives by ranking communication stimuli, usually printed statements, that were sampled from an issue "concourse" (Brown, 1993; McKeown & Thomas, 2013). Participants' quantitative rankings and qualitative interpretations of stimuli are used to reveal the consensus and divergent perspectives that exist about an issue, not how prevalent a particular perspective is in a population (McKeown & Thomas, 2013). This study applies Q to understand how photovoice participants viewed their engagement in the research process and what visual literacy practices it enabled. This application follows existing research using Q as a participatory evaluation of educational programs (e.g., Ramlo, 2015) and public participation processes in environmental management (e.g., Tuler & Webler, 2010). To that end, this study represents a meta-evaluation — a participatory evaluation of photovoice, which is itself a method for participatory needs assessment.

Q Sample: Statements

The Q sample includes all stimuli selected from a concourse used to catalyze and record participant subjectivities. Q samples can be derived from naturalistic elements of discourse, such as quotations from in-person interviews, theoretical assertions from existing research, or a combination of the two (McKeown & Thomas, 2013). Q samples should represent the full range of perspectives within a concourse, which can be ensured through a formal sampling frame, as well as expert validation and non-expert pre-testing (Stephenson, 1993; Brown, 1980; Watts & Stenner, 2005). In this study, I sampled both naturalistic statements from participant interviews and theoretical statements from visual literacy research (Arneson & Offerdahl, 2018; Barreto, 2006; Bowen, 2017; Brill & Branch, 2007) and education standards (ACRL, 2011). This process generated more than 50 statements about visual learning and communication practices that could

be used to evaluate photovoice in the context of self-other-environment relationships. After

debriefing the statements with colleagues, identifying redundancies, and adapting them for internal

consistency, I selected 27 statements (Table 4.4) to represent a hierarchy of visual literacy skills

(Table 4.1): identification (4), interpretation (4), comprehension (4), evaluation (6),

communication (4), and creation (5). I added three additional statements to evaluate a change in

perception (2) and behavior (1) as a result of project engagement (Table 4.4). Together, the final

Q sample contained 30 statements.

Table 4.1

Hierarchy of visual literacy skills

Practice	Skill	Definition	Example Statement
Visual learning	Identification	Determines nature and extent of images needed; selects meaningful images; defines image purpose	S10: "Capture what is important to me"
	Interpretation	Analyzes the material content and symbolic meaning of images; examines the relationship between images	S27: "Analyze what is going on in my surroundings"
	Comprehension	Understands the individual and cultural importance of images	S24: "Understand the views I share in common with others and vice versa"
	Evaluation	Evaluates the effectiveness of image purpose; evaluates the impact of sources on meaning; evaluates aesthetic and technical image characteristics	S4: "Evaluate the impact of my views on other people"
Visual communication	Communication	Uses images creatively and effectively to communicate information; discusses image meaning and impact with others	S7: "Communicate my perspective creatively"

Table 4.1 Continued

| | Creation | Designs meaningful images; aligns visual content with communication purposes | S21: "Create a meaningful story" |

Note. Labels and definitions for the six visual learning and communication skills were derived from the ACRL education standards (ACRL, 2011). Specific statements were derived from those standards, as well as participant interviews and visual literacy research (Arneson & Offerdahl, 2018; Barreto, 2006; Bowen, 2017; Brill & Branch, 2007; Kędra, 2018).

P Sample: Participants

The P sample includes all participants selected to respond to concourse items using their subjective experience (Brown, 1980). The process for selecting participants is dependent on the bounds of the concourse and the range of opinions needed to permit meaningful comparison between groups. Structured sampling frames may be used to select participants, but practical considerations for participant experience and availability often limit their feasibility (McKeown & Thomas, 2013). Further, Q does not require large P samples to ensure trustworthy results.[25] This is due to the intensive nature of the method and its focus on "correlations computed between persons across a set of statements, rather than the standard correlation between traits (such as ratings of statements) across a set of persons" (Danielson, 2009, p. 219). For this study, I limited P sample selection to those people who participated in the photovoice project. I recruited participants for the photovoice project through local stakeholder networks (e.g., environmental organizations) in the Bagaduce and Damariscotta River regions in Maine using criterion and snowball sampling approaches from July 2019 to February 2020 (Lindlof & Taylor, 2011). Of the

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[25] There is a lack of clarity surrounding the optimal number of participants for Q studies. Webler and colleagues (2009) suggest the minimum number of participants should be eight, and they advocate for a 3:1 ratio between statements and participants (e.g., 30 statements for 10 participants).

ten people who were recruited and participated in prior phases of the project, eight people agreed to participate in this final evaluative phase.

Design: Statement Sorts and Debriefing Interviews

I mailed participants a packet containing the 30 statements printed on cards and a sorting grid. Using remote video conference software, I guided individual participants through statements sorts and debriefing interviews (January 2021, average length = 57 minutes), which enabled consented audio-recording and automated transcription. First, I asked participants to read each statement carefully, consider whether or not photovoice enabled them to engage the action printed on the card, and sort the statement into one of three piles (agree, disagree, neutral). During this stage, I encouraged participants to ask clarifying questions about the meaning of any statement. After each statement was sorted into a pile, I asked participants to rank the statements using the sorting grid, which forced them to sort statements into a quasi-normal distribution with fewer grid spaces available at the extremes (Table 4.2). During this stage, I asked participants to review statements sorted into their "agree" pile, select the two statements they agreed with most, and place these statements on the grid in the "4" position. This procedure was replicated until all of the "agree" statements were ranked using the sorting grid. Next, participants selected the two statements they disagreed with most, placing them in the "-4" position, followed by the remaining "disagree" statements. Finally, participants ranked their "neutral" statements using the remaining grid spaces. I acknowledged that participants could swap statements throughout the sorting process, and once they confirmed their final statement distribution, I recorded their rankings. After each sort, I facilitated semi-structured debriefing interviews to explore thoughts participants had about the statements in general, why they were motivated to make specific statement rankings,

what statements or ideas may have been missing from the concourse, and whether shifting the ranking scale in the positive or negative direction would better represent their evaluation of the photovoice project (Watts & Stenner, 2012).

Table 4.2									
Number of statements and corresponding rank in sorting grid									
No. of Statements	2	2	3	5	6	5	3	2	2
Statement Rank	-4	-3	-2	-1	0	1	2	3	4
	Most Disagree								Most Agree

Note. Participants were asked to rank 30 statements, which each described a different action associated with photovoice.

Analysis and Interpretation

Each participant sort was entered into PQ Method 2.35 software for statistical analysis. First, I intercorrelated all participant sorts using principal component analysis (PCA), which revealed sorting patterns across groups of participants, known as factors. He determined the number of factors to extract and rotate via Varimax using those solutions with eigenvalues higher than 1 and an explained variance higher than 10%. After testing multiple solutions, I selected a two-factor solution because it offered the simplest structure with at least two participant sorts loading significantly onto each factor. The final PQ Method analysis generated two factor-representative sorts from the average weightings of all participant sorts. Each averaged sort represents a shared perspective, and factor loadings indicate the degree to which a particular participant corresponds with either of the perspectives. I determined significant loadings using the standard error of a zero-order loading, where N is the number of statements in the expression $2.58(1/\sqrt{N})$ (McKeown & Thomas, 2013). Therefore, factor loadings of $\pm.47$ were significant at

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the .01 level. Factor loadings of participants (Table 4.3) and factor scores of statements (Table 4.4) were interpreted. I triangulated data from the debriefing interview transcripts with statement rankings, including statements ranked highest and lowest (Tables A.1, A.2), distinguishing statements ranked significantly different by factor, and consensus statements ranked similarly by factors.

Table 4.3

Factor loadings of participants after varimax rotation

ID	Age	Sex	Education	Region	Factor 1	Factor 2
P07	64	F	College	Damariscotta	0.8410*	-0.1000
P02	72	M	College	Bagaduce	0.7727*	0.1584
P06	75	F	Postgrad	Damariscotta	0.6554*	0.1896
P08	37	F	Postgrad	Damariscotta	0.5508*	-0.4038
P01	47	F	High School	Bagaduce	0.4671*	0.0559
P03	27	F	College	Bagaduce	0.2375	0.6884*
P05	77	F	Postgrad	Bagaduce	0.0627	0.5644*
P10	45	F	College	Damariscotta	0.1039	-0.7586*

Note. Asterisks indicate $p < .01$ with no cross-loading.

Results

Analysis of participant statement sorts revealed two factors that together account for 49% of the cumulative variance (Table 4.3). Both factors had at least two participant sorts with

statistically significant loadings and no cross loading at $p < .01$. The second factor was bipolar, meaning it presents two connected but opposed perspectives, which will be contrasted (Watts & Stenner, 2005, 2012).[26] These factors are named and interpreted below using the following statement notations: Statement ID, mean factor score, visual literacy skill (Table 4.4).

Factor 1: Individual Narrators

Factor 1 accounts for 29% of the explained variance and is defined by five participant sorts. Photovoice enabled this group of participants to creatively explore their own experience of place. Specifically, these participants were able to identify and document what they value through photography (S10: 4, identify), including their appreciation for local aesthetics (S28: 4, evaluate). This process encouraged participants to think about their collection of photographs as an interconnected narrative (S12: 3, create) worth sharing with others in their local community (S7: 3, communicate). To this end, participants suggested that because photography is creative, it must also be individual. This was exemplified by one participant who suggested, "photography is a creative process … it's your perspective, and it's often very different from other people" (P07). While valued for its ability to express personal perspectives, photography was also considered a time-consuming practice with no clear beginning or end. In contrast, photovoice provided the opportunity and structure needed to reflect purposefully, as another participant said: "This project gave me guidelines to get out and enjoy [this] place … we get caught up in our day to day work, and it was nice to take a step back … to slow down and have a reason to take the time to do it" (P01).

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[26] Factor solutions that include positive and negative factor loadings are considered bipolar (Watts & Stenner, 2005, 2012). They may be interpreted as opposite expressions of the same perspective (e.g., Albizua & Zografos, 2014) or separated as discrete factors (e.g., Clare et al., 2013).

This reflective structure enabled participants to "see new things [they] hadn't seen before" (P02) and catalyzed some of their plans to incorporate photography into future projects for themselves, their business, or their family; however, this structure did not encourage these participants to change how they view other community members (S30: -3, change) nor assess how others used photos to communicate (S14: -3, evaluate). For example, one participant "enjoyed the process of appreciative inquiry that gets you to look at what others think and how they feel," but suggested the process actually solidified their existing alliances for/against neighbors (P06). In other words, photovoice facilitated active listening rather than critical evaluation, and therefore did not necessarily inspire a change in cognition about others. Similarly, photovoice did not change how these participants view their local environment (S3: -4, change) nor their intentions to act upon it (S25: -4, change). This may be due, in part, to the strength of participants' existing relationships with this place, as one participant said: "I have a strong perspective of this place and that hasn't really changed … but by learning more about other people's perspectives, it broadened or enhanced [mine]" (P08). Taken together, participants in Factor 1 used photovoice primarily as a source of internal reflection and constitution, which they felt compelled to narrate for others.

Factor 2: Social Monitors

Factor 2 accounts for 20% of the explained variance and is defined by three participant sorts. Two of the participant sorts loaded positively (Factor 2a), whereas the third sort loaded negatively (Factor 2b).

Factor 2a. Photovoice enabled Factor 2a participants to collaboratively explore others' experience of place. In particular, these participants were able to recognize what others value (S29: 4, identify) and incorporate those values into their own meaning-making (S8: 3, create).

Photovoice provided a (virtual) space to share understanding, as one participant indicated: "Just to hear from people who I don't have as neighbors because there's a river or road in the way … to hear their different views, their whole history of memory and appreciation, was very helpful" (P05). Further, these participants expected others to commit to the work necessary for collaboration, as the other participant suggested: "We would have sold each other short if we didn't trade views and understandings … the key piece of [photovoice] was expressing your views and putting them into conversation with each other" (P03). As a result of this collaboration, participants felt they had begun to investigate what was happening in their local environment (S27: 4, interpret), as well as how their views impacted others in their community (S4: 3, evaluate). participants also felt the process was an inviting way to reveal shared affect despite different daily experiences: "It's a good way to begin to think about things … to start with what you know … affirming there are differences, but most of the differences were affirming how we all feel about this place (P03). Therefore, photovoice sustained but did not change participants' intentions to act upon the local environment (S25: -4, change), nor did it motivate them to facilitate place-based discussions outside of the project (S19: -4, communicate). As evidence for this, participants cited existing community relationships and commitments to show they are already involved in routine actions and discussions about environmental protection. In addition, photovoice did not enable these participants to capture what they viewed was most important (S10: -3, identify) nor use photographs to represent more abstract ideas (S21: -3, create). participants suggested that this was due to their existing experience with photography, which was not enhanced through photovoice. Taken together, Factor 2a participants used photovoice primarily as a source of social collaboration and comparison, which they felt contributed more meaning than they could alone.

Factor 2b. The third participant in factor 2 offers a distinct yet connected perspective. As a self-identified "poetic observer," they were hesitant to draw conclusions about what others value (S29: -3, identify): "It seems a little too limiting and conclusive for me to just know what other people value by the [few] photos they've taken … they're supposed to be open for interpretation" (P10). This openness to ambiguity and acknowledgement of project limits further impacted their difference in opinion about the role of photovoice in assessing their impact on others (S4: -4, evaluate) and investigating what is happening in the local environment (S27: -4, interpret). They cited the necessity of additional work outside the project, including summative reflection and broader public engagement. To this end, the participant indeed suggested photovoice encourages communication beyond the scope of the project (S19: 4, communicate): "This [goes] beyond just a dialogue between us … if I can just use my perspective and extend my own vision … it's in perpetuity essentially." (P10). Like the other participants in factor 2, this participant valued the group orientation of photovoice, but they attributed more value to passively observing the group than actively participating in it. In other words, this participant situated themselves from the outside looking in and separated their perspective from others.

Table 4.4

Average statement rank and Z score per factor

			Factor 1		Factor 2	
No.	Statement	Skill	Rank	Z score	Rank	Z score
29	Identify what other people value	Identify	1	0.58*	4	1.87
26	†Recognize the role I play in creating meaning	Identify	0	0.25	2	0.83
10	Capture what is important to me	Identify	4	1.94*	-3	-1.2
5	Express what I know about my surroundings	Identify	2	0.93*	-2	-0.8

Table 4.4 Continued

27	Analyze what is going on in my surroundings	Interpret	1	0.52*	4	1.81
16	†Relate to other people's views	Interpret	1	0.56	0	-0.23
13	Interpret other people's knowledge about this place	Interpret	-1	-0.66*	1	0.33
6	Identify how context can shape views	Interpret	0	-0.29	-2	-0.68
24	†Understand the views I share in common with others and vice versa	Comprehend	2	0.96	0	0.24
9	†Learn how others bring their own perspectives	Comprehend	1	0.53	1	0.48
20	†Validate my interpretations through discussion with others	Comprehend	-1	-0.3	1	0.29
23	Understand my surroundings in a new way	Comprehend	-2	-0.83*	0	0.16
28	Appreciate the aesthetic experience this place provides	Evaluate	4	1.81*	2	0.74
4	Evaluate the impact of my views on other people	Evaluate	-2	-0.85*	3	1.59
18	Appreciate the vision of others	Evaluate	2	0.64*	-1	-0.29
11	†Assess perspectives different from my own	Evaluate	0	0.17	-1	-0.35
14	Evaluate how effectively other people communicate	Evaluate	-3	-1.19*	1	0.41
17	Assess the impact of my surroundings on my views	Evaluate	-2	-1.19*	1	0.29
8	†Create meaning collaboratively with other people	Create	1	0.46	3	1.28
12	Create a meaningful story	Create	3	1.23*	-2	-0.95
22	Respond to the goals of the research project	Create	-1	-0.51*	2	0.62
15	†Create new meaning out of other people's stories	Create	0	-0.26	0	-0.14
21	Represent an abstract idea or argument	Create	0	0.43*	-3	-1.01

Table 4.4 Continued

7	Communicate my perspective creatively	Communicate	3	1.05*	0	0.08
1	†Communicate my perspective effectively	Communicate	0	0.03	-1	-0.37
2	†Explore different ways to communicate	Communicate	-1	-0.39	-1	-0.25
19	Communicate beyond the scope of this project	Communicate	-1	-0.32*	-4	-2.56
30	†Change my perspective about others	Change	-3	-1.2	-1	-0.43
3	Change my perspective about this place	Change	-4	-2.23*	0	0.23
25	†Change my intentions to act with respect to this place	Change	-4	-1.88	-4	-1.98

Note. Rank and *Z* score data represent the average weighted sorts per factor. Daggers (†) indicate consensus statements that are non-significant at $p > .01$. Asterisks (*) indicate distinguishing statements that are significant at $p < .01$. Data is organized by skill and then average statement rank between factors.

Discussion

This study presents a participatory evaluation of photovoice. The goals of this study were to understand the visual literacy practices participants engaged through photovoice and how those practices influenced participants' assessment of methodological goals, including to record community conditions and promote local knowledge through critical dialogue. The results indicate that visual literacy engagement and methodological assessment were dependent on whether participants viewed photovoice as either an individual or social endeavor and the extent to which the project structure met related expectations.

Visual Literacy Engagement

Factor scores of statements and means of statement categories indicate that photovoice participants engaged in the visual literacy practices of visual learning and communication. All participants reported engagement with the visual learning skills of identification and evaluation. Through photography and photo-based discussion, the "individual narrators" in factor 1 identified personal values, whereas the "social monitors" in factor 2 identified the values of other participants. This practice of identification provided opportunities for participants to organize and structure new or existing value associations; however, participants were hesitant to relate this practice to documenting local knowledge or expertise. In terms of evaluation, the "individual narrators" reported an appreciation for their surroundings, whereas the "social monitors" reported more critical evaluation, considering the impact of their views on others. The intermediate visual learning practices of interpretation and analysis were further bifurcated, with the "individual narrators" reporting limited to no engagement and "social monitors" reporting analysis of their surroundings. All participants reported engagement with the visual communication skill of creation. Similar to practices of identification, "individual narrators" created new meaning individually, whereas "social monitors" created new meaning collaboratively. In addition, "individual narrators" felt they not only created meaning but used photos to communicate such meaning creatively. Taken together, participants reported engaging in the visual literacy practice of learning more than communicating. "Individual narrators" tended to emphasize learning about their relationship with the local environment through the practice of identification, and "social monitors" tended to emphasize learning about their relationship with others through the practices

of interpretation and evaluation. This indicates that "social monitors" reported more critical and relational engagement with photovoice than the "individual narrators."[27]

Photovoice Project Assessment

Participant reports of their visual literacy engagement help assess whether or not the goals of this photovoice project were attained, as well as the circumstances that enabled or impeded goal attainment.[28] Participant responses suggest the first goal of photovoice, to record and reflect community conditions, was largely attained (Wang & Burris, 1994, 1997). This goal aligns most closely with visual learning practices and suggests that photovoice facilitated photographic documentation of social-ecological change in participants' everyday life (Avgerinou & Pettersson, 2020). In many cases, reflection about the photos further grounded their cognitive, affective, and behavioral responses to change and how it impacted their broader conceptualization of self in relation to community and the environment. Participant responses suggest the second goal of photovoice, to promote critical dialogue and local knowledge, was partially attained (Wang & Burris, 1994, 1997). This goal aligns with both visual learning and communication practices, and it can support participant development of "critical consciousness" by empowering active resistance to normative and potentially hegemonic visions encountered in everyday life (Avgerinou & Pettersson, 2020; Freire 1970/2005; Mirzoeff, 1998). In this case, participants' visual literacy practice did not always move from descriptive identification to higher-level engagement that

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[27] On average, "individual narrators" desired a positive shift in the ranking scale, which would increase the ranking of each statement by two (e.g., from -2 to 0) and indicate higher-level engagement. "Social monitors" desired no shift on average.

[28] Photovoice integrates many different goals, and S22 refers to attaining the goals of the photo assignments, which "individual narrators" ranked -1 and "social monitors" ranked 2. This indicates that photovoice did not always help them engage the photo assignments, despite contrary evidence (see Chapter 2).

involves critical interpretation, evaluation, and communication (Bowen, 2017). As a result, this photovoice study encouraged participant development of a "reflective consciousness" instead of "critical consciousness" (Latz, 2012). While some participants did engage critical and relational visual literacy practices, these practices did not increase participants' sense of control over the existing community conditions.

Participant explanations for lack of higher-level engagement focused on project structure, including group size, discussion format, and options to share the photovoice results publicly. While COVID-19 prompted many of these structural changes, it offers critical insight about the impact of methodological adaptations on participant engagement and related assessment. Considering group size, participants acknowledged discussion with four to five people limited the diversity of experiences and views shared. Importantly, participants expected to encounter multiple views that explicitly challenged their way of seeing and suggested including more participants would have created additional opportunities to contextualize conflict and inspire change in their perspectives. This implies small group sizes may not always provide enough diversity to encourage the more critical or relational practices associated with visual learning. Considering the discussion format, participants suggested that one group discussion with two photos from each participant limited the full meaning-making potential of the project. Group discussion exposed them to different approaches to photography, and several expressed a desire to apply that knowledge and evaluate their communication efforts through an additional round of photography and discussion. Relatedly, participants acknowledged the change in discussion format, from in-person to online, limited the opportunities for communication by changing turn-taking dynamics and eliminating one-on-one conversations outside of the formal photo discussion (Abrams & Gaiser, 2017; Taylor, 2011). Together, the photovoice discussion format influences opportunities not only to encourage critical

and relational practices of visual learning, but also to refine and assess visual communication impacts. Finally, considering public dissemination of photovoice results, many participants were initially attracted to the project because it gave them a platform to share their experiences with the wider community. This opportunity for social exchange was acknowledged to be important in preserving and/or transforming their individual narratives, but importantly, not something that could necessarily be accomplished within the small group. Participants suggested the lack of public engagement, particularly before the evaluation, made it difficult to assess their impact on others.[29]

Conclusion

Research evaluating photovoice has called for practitioners to be more explicit about their intended goals and outcomes (Catalani & Minkler, 2010; Derr & Simons, 2020; Fantini, 2017; Foster-Fishman et al., 2005; Latz, 2012). This not only includes the specific goals identified in their research question, but also the methodological goals of photovoice. However, even with added clarity, perceptions about goal-attainment may differ between photovoice practitioners and participants. To account for these differences, this study evaluated how participants perceived their engagement with the visual literacy practices that can be associated with photovoice goal-attainment. In doing so, this study distinguished individual and social approaches to visual learning and communication that contribute to a "reflective consciousness" and, in some cases, more critical and relational engagement (Latz, 2012). Therefore, this novel theoretical integration and methodological evaluation provides evidence that photovoice action planning is only one among

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[29] In lieu of a public exhibition, participants' photographs and narratives will be shared online through a project website created by the researcher. This alternative was collaboratively identified and decided by participants before conducting the evaluation.

the many potential outcomes that can make a difference in participants' understanding of and engagement with the visual constructions in everyday life.

CHAPTER 5

CONCLUSION

My dissertation research investigated individual and social constructions of environmental change through a multi-stage photovoice project and a Q method evaluation. The second chapter identified what social-ecological changes participants perceived to impact their community and how related interactions were constructed in the context of resilience. The third chapter explored how participants used photographs in individual and group communication contexts, including the material and dialogic factors that impacted opportunities for meaning-making. The fourth chapter evaluated how the photovoice methodology impacted participants' perceived development of visual learning and communication skills. Overall, the previous chapters indicate how photographs open a dialogic space for individual and social learning about the complex interactions between constructions of environmental change and community responses. This chapter provides a summary of that research, including a review of the limitations impacting each stage of the study; the lessons learned for engaging photovoice as a methodology, visual communication practice, and social-ecological system assessment; and avenues for future research.

Limitations

This research was limited by the time-intensive nature of the photovoice methodology, my individual capacity as the sole researcher, and complications wrought by COVID-19. These factors influenced the number of participants, the number of methodological iterations, and the format of public dissemination of the research results. As these limitations were largely described in the previous chapters, they will be summarized below with implications and recommendations for photovoice research.

First, the number of participants limited the diversity of perspectives available to the me and the opportunity for participants to engage with perspectives different from their own. For example, multiple participants whose livelihoods relied on the river had to withdraw from the project due to scheduling conflicts and economic uncertainty due to COVID-19. This reflects the difficulty for photovoice research, and other participatory methods, to engage working professionals whose schedules do not offer flexibility. In this case, the inclusion of those participants may have contributed additional perspectives about marine resource use that complimented or conflicted with other participants' experiences on the water.

Second, the single iteration of photography, individual interviews, and group discussions limited opportunities for participants to collaborate with each other and me. Participants acknowledged a tension between the time commitment of the project and their desired outcomes. For example, in addition to scheduling each project meeting, participants expressed difficulty planning their photography sessions around work schedules and local environmental factors, such as the weather and tides. Despite these challenges, they hoped their commitment would help them build relationships with community members, both inside and outside their regional group, and refine communication skills. While they suggested these desired outcomes may have been achieved with additional iterations of photography and discussion, neither they nor I could commit the time to fully accomplish them. In addition, I experienced a similar tension between meeting the project schedule and actively incorporating participants into data interpretation. While participants were able to contribute a broad thematic analysis during the group discussion, which is common among photovoice applications, time constraints limited my ability to validate further analyses with participants.

Third, the lack of a public photo exhibition limited the opportunity for participants to share their knowledge and experiences with others in their community. Many participants felt a public exhibition would offer an additional opportunity to engage different community perspectives, including those with more traditional decision-making authority, and receive critical feedback on the salience of their visual representations. While impeded by project amendments and delays due to COVID-19, this reflects the importance for participants to transfer their individual and group findings beyond the scope of the project and the related uncertainty associated with their individual impact on community perceptions.[30]

Together these limitations provide insights into the degree of public participation required to meet photovoice project goals and participants' desired outcomes. To address the limitations associated with participant availability and attrition, researchers should consider collaborating with existing community groups or organizations that may be able host photovoice sessions as part of their regular programming. This is common among photovoice applications, particularly when the research questions or photography assignments are developed collaboratively to meet a specific community need. That said, researchers should be cautious about the potential biases related to group composition and weigh the impact of missing perspectives. To address the limitations associated with the desired project format and goals, researchers should ask participants about desired outcomes at the start of a project, for example during the orientation, and explain the methods likely needed to achieve those ends. This would not only help participants understand the benefits of various degrees and types of participation but also build commitment to realistic group

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[30] While public photo exhibits are a key dissemination tool for photovoice, they are not always integrated into study design, and the frequency of their integration varies across disciplinary applications (e.g., Catalani & Minkler, 2010; Fantini, 2017; Hergenrather et al., 2009).

goals. In this case, the researcher should revisit those goals and methods after each iteration to respond to their needs and desires moving forward.

Lessons Learned

Photovoice is a community-based research methodology that uses participatory photography to identify and contextualize community issues and conditions that impact local needs. As a critical method with emancipatory aims, it is traditionally used for community assessment, planning, and action. To that end, photovoice applications and analyses tend to prioritize pragmatic goals over constitutive practices related to individual and group communication (Pezzullo & Cox, 2018). My dissertation research (re)positions photovoice as a visual communication method and prioritizes analysis of its constitutive functions. In doing so, this research integrated visual communication concepts and theories to demonstrate how the method works and how researchers can use it more effectively, particularly in the context of coastal change. This section highlights some of the lessons learned for considering photovoice as a research methodology, a visual communication practice, and an assessment of social-ecological system resilience.

Photovoice as a Research Methodology

As a participatory research methodology, photovoice gives community members more control over the research process and presents dialogic opportunities for topic selection, data collection, analysis, and interpretation. Researchers invite participants to identify, contextualize, and codify the issues they encounter in their daily lives, which may or may not reflect those issues prioritized by researchers, government officials, community planners, or other public

communicators. This bottom-up process provides valuable information about the relative visibility of different community issues and the frames community members use to think about, communicate, and construct those issues (see Chapter 2). This information can then be used to frame public communication and planning efforts in ways that validate local knowledge and experience and, in turn, reveal further opportunities for education and engagement surrounding critical issues that may be invisible to those with more decision-authority (Cote & Nightingale, 2012). Whether or not this process inspires community action, it provides participants with valuable opportunities to construct knowledge and understanding through "reflective consciousness" building and critical negotiation of relationships and relationality, including between researcher, participant, community, and local environment (Latz, 2012; see Chapters 3 and 4). In other words, photovoice encourages new ways of seeing the self in relation to and in communion with others.

Photovoice as a Visual Communication Practice

Visual communication research tends to prioritize investigations of visual content and its impact on audience reception, and this dissertation research responds to recent calls to critically consider other sites of meaning-making, namely visual production (Hansen & Machin, 2013; Rose, 2016). As a research methodology predicated on community production of photographs for visual communication, photovoice provided an opportunity to study the interactions between each site of meaning-making.

This research demonstrated how the relationship between visual production and content is negotiated through topic selection, communication goals, production approaches, and material affordances. Participants acknowledged the ambiguity of environmental change as a topic and

expressed difficulty documenting and/or representing the dynamic process or experience of change in a still photograph. While navigating this complexity was an intentional component of the research design, it impacted what and how issues were made visible (see Chapter 2). In addition, participants noted different reasons for engaging in visual communication practices, including to communicate their own views or to see how others communicated their views, which impacted their assessment of individual and social learning (see Chapter 4). Finally, participants took both deliberate and exploratory approaches to photography (Bendell & Sylvestre, 2017), which not only impacted their topic selection, material exploration, and goal assessment, but also their openness to new ways of seeing (see Chapters 3 and 4).

This research also demonstrated how the relationship between visual content and reception is negotiated through photo sharing practices, audience composition, and evaluation opportunities. Participants often switched between communicating *about* and *with* photographs depending on the communication context (e.g., individual interviews versus group discussions) and the primacy and concreteness of material content (Lobinger 2016; see Chapters 2 and 3). This impacted how participants related to me, each other, and different photographs, as well as the diversity of issues they negotiated. Participants' photo sharing practices were also influenced by the composition of their group audience. In particular, this research indicates that participants' familiarity with each other, shared cultural experiences, and their length of local residence impacted their openness to engage in difference (e.g., through conflict) and frame material content as a representation of past or present issues (see Chapters 2 and 3). Finally, participants indicated that the number of opportunities they had to engage with each other and the photographs influenced their ability to assess the impact of their content on others and limited their ability to refine their communication skills (see Chapter 4). Together, these considerations provide valuable context about the ways in

which photovoice participants negotiate meaning through photographic production, content, and reception.

Photovoice as an Assessment of Social-Ecological Systems

Taking a social-ecological systems approach to research means investigating the complex interactions among various, nested system components that influence its structure and function within a specific setting or problem context (McGinnis & Ostrom, 2014). This descriptive-analytical approach is traditionally applied to interdisciplinary research as a conceptual framework and boundary object to identify and assess existing synergies and unstudied interactions within a focal system (Becker, 2012; Brand & Jax, 2007; Johnson et al., 2019). As a research methodology and visual communication practice that critically negotiates system interactions, photovoice provided an opportunity to study social-ecological resilience from the cultural, historical, and ethical perspectives of community members.

Any investigation of social-ecological system resilience should consider who identifies the focal system of interest and demarcates its boundaries. This research focused on two river estuaries in Maine, and the photovoice method contributed knowledge about where local residents draw their own system boundaries. For example, rather than focus their photographs and discussion on the waterbody itself, participants tended to focus on distinct sites of individual and cultural importance that were adjacent to the water, such as public landings, conserved lands, historic sites, and personal properties. Photovoice encouraged participants to negotiate their relationship with these sites, which they tended to describe and analyze through key interactions that did not often separate social and ecological components (see Chapter 2). This local knowledge can help researchers, government officials, and community planners understand what system components

are most salient to community members and what dominant forces are perceived to drive or impact their interactions. Finally, this research revealed the spatiotemporal scale which community members use to frame system boundaries and interactions, which influenced their perceptions about the drivers, desirability, and controllability of local change. These considerations and contributions indicate a symbiotic relationship between the photovoice methodology and social-ecological systems approach, and together they offer a way to engage communities that are undergoing significant change.

Future Research

My dissertation research focused on the past and present changes coastal residents made visible through photography and the way they negotiated their responses to these changes through visual communication. The results contextualize the material and dialogic affordances of photography, but they also reaffirm questions about the utility of photography in visualizing future change and inspiring more proactive behavior (Doyle, 2009). Researchers have begun to address these questions by exploring the relationship between visual content (e.g., photographs, maps, and virtual reality) and reception, including how visuals impact risk perceptions and behavioral intentions (e.g., Calil et al., 2021; Rickard et al., 2017). Others have integrated more participatory approaches to visual production with vulnerability assessment (e.g., participatory GIS; Morse et al., 2020). In future research, these approaches could be combined with a photo elicitation or photovoice study, wherein participants photograph sites where change is anticipated or desired. In addition, or alternatively, researchers may encourage participants to edit or annotate photographs to reflect that desired or anticipated change. This research could be applied to a more specific change (e.g., storm surge) and function as a standalone project or an additional iteration of an

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existing project. For example, a study could integrate photovoice with a risk communication experiment on storm surge messaging. Such an approach would invite community members to construct visual narratives about severe weather impacts and preparation, and researchers could test the relative effectiveness of these narratives versus more traditional and technical risk messages. If effective, these narratives could be incorporated into existing messaging by local, state, or federal agencies (e.g., National Weather Service), which may further democratize risk communication efforts and help embed them within their place-based contexts (Lejano et al., 2018). Such research would not only help locate vulnerable areas and validate local knowledge, but also reorient community discussions around proactive responses to change.

REFERENCES

Abrams, K. M., & Gaiser, T. J. (2017). Online focus groups. In N. G. Fielding, R. M. Lee, & G. Blank (Eds.), *The sage handbook of online research methods* (pp. 435-449). SAGE Publications.

Adger, W. N. (2000). Social and ecological resilience: Are they related? *Progress in Human Geography, 24*(3), 347-364.

Albizua, A., & Zografos, C. (2014). A values-based approach to vulnerability and adaptation to climate change. Applying Q methodology in the Ebro Delta, Spain. *Environmental Policy and Governance, 24*(6), 405-422.

Alvarez, N., Somes, W. L., Noblet, C. L., Evans, K. S., Britwum, K., & Teisl, M. F. (2019). *2019 Maine marine aquaculture survey results* [Technical report, Sustainable Ecological Aquaculture Network]. University of Maine.

Arneson, J. B., & Offerdahl, E. G. (2018). Visual literacy in Bloom: Using Bloom's taxonomy to support visual learning skills. *CBE—Life Sciences Education, 17*(1), 1-8.

Association of College and Research Libraries. (2011). *Visual literacy competency standards for higher education*. https://www.ala.org/acrl/standards/visualliteracy

Association of College and Research Libraries. (2016). *Framework for information literacy for higher education*. https://www.ala.org/acrl/standards/ilframework

Avgerinou, M. D., & Pettersson, R. (2011). Toward a cohesive theory of visual literacy. *Journal of Visual Literacy, 30*(2), 1-19.

Avgerinou, M. D., & Pettersson, R. (2020). Visual literacy. In S. Josephson, J. Kelly, & K. Smith (Eds.), *Handbook of visual communication: Theory, methods, and media* (pp. 433-64). Routledge.

Baldwin, C., & Chandler, L. (2010). "At the water's edge": Community voices on climate change. *Local Environment, 15*(7), 637-649.

Balomenou, N., & Garrod, B. (2016). A review of participant-generated image methods in the social sciences. *Journal of Mixed Methods Research, 10*(4), 335-351.

Barbour, R. (2007). *Doing focus groups*. SAGE Publications.

Barreto, S. L. C. (2006). Photography as a visual literacy tool. *Colombian Applied Linguistics Journal*, 228-242.

Becker, E. (2012). Social-ecological systems as epistemic objects. In M. Glaser, G. Krause, B. M. W. Ratter, & M. Welp (Eds.), *Human-nature interactions in the anthropocene* (pp. 55-77). Routledge.

Beh, A., Bruyere, B. L., & Lolosoli, S. (2013). Legitimizing local perspectives in conservation through community-based research: A photovoice study in Samburu, Kenya. *Society & Natural Resources, 26*(12), 1390-1406.

Bendell, K., & Sylvestre, J. (2017). How different approaches to taking pictures influences participation in a photovoice project. *Action Research, 15*(4), 357-372.

Bennett, N. J., & Dearden, P. (2013). A picture of change: Using photovoice to explore social and environmental change in coastal communities on the Andaman Coast of Thailand. *Local Environment, 18*(9), 983-1001.

Berbés-Blázquez, M. (2012). A participatory assessment of ecosystem services and human wellbeing in rural Costa Rica using photo-voice. *Environmental Management, 49*(4), 862-875.

Berger, J. (1972) *Ways of Seeing*. Penguin.

Bisung, E., & Elliott, S. J. (2019). Community water supply improvement and wellbeing: A pre-post photovoice intervention study in Kenya. *Habitat International, 85*, 14-20.

Blummer, B. (2015). Some visual literacy initiatives in academic institutions: A literature review from 1999 to the present. *Journal of Visual Literacy, 34*(1), 1-34.

Bowen, T. (2017). Assessing visual literacy: A case study of developing a rubric for identifying and applying criteria to undergraduate student learning. *Teaching in Higher Education, 22*(6), 705-719.

Brand, F. S., & Jax, K. (2007). Focusing the meaning(s) of resilience: Resilience as a descriptive concept and a boundary object. *Ecology and Society, 12*(1).

Breny, J. M., & McMorrow, S. L. (2020). *Photovoice for social justice: Visual representation in action*. SAGE Publications.

Bricknell, I. R., Birkel, S. D., Brawley, S. H., Van Kirk, T., Hamlin, H. J., Capistrant-Fossa, K., ... & Moeykens, S. (2021). Resilience of cold water aquaculture: A review of likely scenarios as climate changes in the Gulf of Maine. *Reviews in Aquaculture*, *13*(1), 460-503.

Brill, J. M., & Branch, R. M. (2007). Visual literacy defined – The results of a Delphi study: Can IVLA (operationally) define visual literacy? *Journal of Visual Literacy, 27*(1), 47-60.

Brown, S. R. (1980). *Political subjectivity: Applications of Q methodology in political science*. Yale University Press.

Brown, S. R. (1993). A primer on Q methodology. *Operant Subjectivity, 16*(3/4), 91-138.

Brumberger, E. (2011). Visual literacy and the digital native: An examination of the millennial learner. *Journal of Visual Literacy, 30*(1), 19-47.

Bulla, B., & Steelman, T. (2016). Farming through change: Using photovoice to explore climate change on small family farms. *Agroecology and Sustainable Food Systems, 40*(10), 1106-1132.

Buzzanell, P. M. (2010). Resilience: Talking, resisting, and imagining new normalcies into being. *Journal of Communication, 60*(1), 1-14.

Byrne, E., Daykin, N., & Coad, J. (2016). Participatory photography in qualitative research: A methodological review. *Visual Methodologies, 4*(2), 1-12.

Cai, Y. (2020). Visualizing vulnerability for inclusive community resilience: Photovoice evidence from the Philippines. *Journal of Planning Education and Research*. Advance online publication. doi: 10.1177/0739456X20949644

Calil, J., Fauville, G., Queiroz, A. C. M., Leo, K. L., Mann, A. G. N., Wise-West, T., ... & Bailenson, J. N. (2021). Using virtual reality in sea level rise planning and community engagement – An overview. *Water, 13*(9), 1142.

Carpenter, S., Walker, B., Anderies, J. M., & Abel, N. (2001). From metaphor to measurement: Resilience of what to what? *Ecosystems, 4*(8), 765-781.

Catalani, C., & Minkler, M. (2010). Photovoice: A review of the literature in health and public health. *Health Education & Behavior, 37*(3), 424-451.

Chanse, V., Mohamed, A., Wilson, S., Dalemarre, L., Leisnham, P. T., Rockler, A., ... & Montas, H. (2017). New approaches to facilitate learning from youth: Exploring the use of Photovoice in identifying local watershed issues. *The Journal of Environmental Education, 48*(2), 109-120.

Chess, C., & Purcell, K. (1999). Public participation and the environment: Do we know what works? *Environmental Science & Technology, 33*(16), 2685-2692.

Christensen, L., & Krogman, N. (2012). Social thresholds and their translation into social-ecological management practices. *Ecology and Society, 17*(1).

Christensen, M. C., Capous-Desyllas, M., & Arczynski, A. V. (2020). Photovoice as a multilevel tool for gender and sexual identity exploration. *Families in Society, 101*(2), 219-231.

Chu, H., & Yang, J. Z. (2020). Risk or efficacy? How psychological distance influences climate change engagement. *Risk Analysis, 40*(4), 758-770.

Clare, S., Krogman, N., & Caine, K. J. (2013). The "balance discourse": A case study of power and wetland management. *Geoforum, 49*, 40-49.

Collier J. (1957). Photography in anthropology: A report on two experiments. *American Anthropologist, 59*(5), 843-859.

Collier, J., & Collier, M. (1986). *Visual anthropology: Photography as a research method*. UNM Press.

ConnectMaine. (2020). *State of Maine broadband action plan.* https://www.maine.gov/connectme/about/annual-reports

Cote, M., & Nightingale, A. J. (2012). Resilience thinking meets social theory: Situating social change in socio-ecological systems (SES) research. *Progress in Human Geography, 36*(4), 475-489.

Cronon, W. (1996). The trouble with wilderness or, getting back to the wrong nature. *Environmental History*, *1*(1), 7-28.

Cumming, G. S., & Collier, J. (2005). Change and identity in complex systems. *Ecology and Society, 10*(1).

Dallow, P. (2008). The visual complex: Mapping some interdisciplinary dimensions of visual literacy. In J. Elkins (Ed.), *Visual literacy* (pp. 91-104). Routledge.

Dalton, T., Jin, D., Thompson, R., & Katzanek, A. (2017). Using normative evaluations to plan for and manage shellfish aquaculture development in Rhode Island coastal waters. *Marine Policy, 83*, 194-203.

Danielson, S. (2009). Q method and surveys: Three ways to combine Q and R. *Field Methods, 21*(3), 219-237.

Davis, R. T. (1939). *The art museum and the secondary school*. Albright Art Gallery.

Debes, J. L. (1969). The loom of visual literacy. *Audiovisual Instruction, 14*, 25-27.

Delicath, J. W., & DeLuca, K. M. (2003). Image events, the public sphere, and argumentative practice: The case of radical environmental groups. *Argumentation, 17*(3), 315-333.

Derrida, J. (2016). *Of grammatology*. Johns Hopkins University Press. (Original work published in 1967).

Derr, V., & Simons, J. (2020). A review of photovoice applications in environment, sustainability, and conservation contexts: Is the method maintaining its emancipatory intents? *Environmental Education Research, 26*(3), 359-380.

Doyle, J. (2007). Picturing the clima(c)tic: Greenpeace and the representational politics of climate change communication. *Science as Culture, 16*(2), 129-150.

Doyle, J. (2009). Seeing the climate? The problematic status of visual evidence in climate change campaigning. In S I. Dobrin, & S. Morey (Eds.), *Ecosee: Image, rhetoric, nature* (pp. 279-298). SUNY Press.

Duan, R., Takahashi, B., & Zwickle, A. (2019). Abstract or concrete? The effect of climate change images on people's estimation of egocentric psychological distance. *Public Understanding of Science, 28*(7), 828-844.

Duffy, K. P., Cipparone, H. C., Johnson, E. S., Rickard, L. N., Beard, K., & Nascimento, F. (2020). Leveraging spatial dimensions of news media content analysis to explore place-based differences in natural resource issues. *Journal of Environmental Studies and Sciences*, 1-7.

Duffy, K. P., & Rickard, L. N. (2017). *Print media analysis of Maine aquaculture coverage* [Technical report, Sustainable Ecological Aquaculture Network]. University of Maine.

Duffy, K. P., Rickard, L. N., & Grosswiler, P. (2019). Routine influences on aquaculture news selection: A Q method study with New England journalists. *Science Communication, 41*(5), 602-632.

Elkins, J. (Ed.). (2008). *Visual literacy*. Routledge.

Evans-Agnew, R. A., & Rosemberg, M. A. S. (2016). Questioning photovoice research: Whose voice? *Qualitative Health Research, 26*(8), 1019-1030.

Ewald, W. (1985). *Portraits and dreams: Photographs and stories by children of the Appalachians*. Writers and Readers Publications.

Fairey, T., & Orton, L. (2019). Photography as dialogue. *Photography and Culture, 12*(3), 299-305.

Fantini, E. (2017). Picturing waters: a review of Photovoice and similar participatory visual research on water governance. *Wiley Interdisciplinary Reviews: Water, 4*(5), e1226.

Fischer, H., Cho, H., & Storksdieck, M. (2021). Going beyond hooked participants: The nibble-and-drop framework for classifying citizen science participation. *Citizen Science: Theory and Practice*, *6*(1), 1-18.

Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: Integrating resilience, adaptability and transformability. *Ecology and Society, 15*(4).

Folke, C. (2006). Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change, 16*(3), 253-267.

Freire, P. (2005). *Education for critical consciousness*. Continuum. (Original work published in 1974).

Freire, P. (2005). *Pedagogy of the oppressed*. Continuum. (Original work published in 1970).

Gamson, W. A., & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology, 95*(1), 1-37.

Goffman, E. (1974). *Frame analysis: An essay on the organization of experience*. Harvard University Press.

Gifford, R. (2011). The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. *American Psychologist, 66*(4), 290.

Gunderson, L. H. (2000). Ecological resilience – In theory and application. *Annual Review of Ecology and Systematics, 31*(1), 425-439.

Hamborg, S., Meya, J. N., Eisenack, K., & Raabe, T. (2020). Rethinking resilience: A cross-epistemic resilience framework for interdisciplinary energy research. *Energy Research & Social Science, 59*, 101285.

Handmer, J. W., & Dovers, S. R. (1996). A typology of resilience: Rethinking institutions for sustainable development. *Industrial & Environmental Crisis Quarterly, 9*(4), 482-511.

Hanes, S. P. (2018). Aquaculture and the postproductive transition on the Maine coast. *Geographical Review, 108*(2), 185-202.

Hansen, A. (1991). The media and the social construction of the environment. Media, Culture & Society, 13(4), 443-458.

Hansen, A., & Cox, J. R. (Eds.). (2015). *The Routledge handbook of environment and communication*. Routledge.

Hansen, A., & Machin, D. (2013). Researching visual environmental communication. *Environmental Communication, 7*(2), 151-168.

Harper, D. (1988). Visual sociology: Expanding sociological vision. *The American Sociologist, 19*(1), 54-70.

Harper, D. (2002). Talking about pictures: A case for photo elicitation. *Visual Studies, 17*(1), 13-26.

Harper, D. (2012). *Visual sociology*. Routledge.

Harris, B. R. (2010). Blurring borders, visualizing connections: Aligning information and visual literacy learning outcomes. *Reference Services Review, 38*(4), 523-535.

Hatala, A. R., Njeze, C., Morton, D., Pearl, T., & Bird-Naytowhow, K. (2020). Land and nature as sources of health and resilience among Indigenous youth in an urban Canadian context: A photovoice exploration. *BMC Public Health, 20*(1), 1-14.

Hergenrather, K. C., Rhodes, S. D., Cowan, C. A., Bardhoshi, G., & Pula, S. (2009). Photovoice as community-based participatory research: A qualitative review. *American Journal of Health Behavior, 33*(6), 686-698.

Hissa, K. (2016). *Using photovoice to understand climate change adaptation in rural Ontario* [Master's thesis, Wilfrid Laurier University]. Environmental Sciences Commons.

Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics, 4*(1), 1-23.

Holling, C. S. (1986). The resilience of terrestrial ecosystems: Local surprise and global change. In W. C. Clark, & R. E. Munn (Eds.), *Sustainable development of the biosphere* (pp. 292-317). Cambridge University Press.

Holling, C. S. (1996). Engineering resilience versus ecological resilience. In P. Schulze (Ed.), *Engineering within ecological constraints* (pp. 32-43). National Academies Press.

Houston, J. B., Spialek, M. L., Cox, J., Greenwood, M. M., & First, J. (2015). The centrality of communication and media in fostering community resilience: A framework for assessment and intervention. *American Behavioral Scientist, 59*(2), 270-283.

Hubbard, J. (1991). *Shooting back: A photographic view of life by homeless children*. Chronicle Books.

Jacobson, T. E., & Mackey, T. P. (2013). Proposing a metaliteracy model to redefine information literacy. *Communications in Information Literacy, 7*(2), 84-91.

Janssen, M. A., Bodin, Ö., Anderies, J. M., Elmqvist, T., Ernstson, H., McAllister, R. R., ... & Ryan, P. (2006). Toward a network perspective of the study of resilience in social-ecological systems. *Ecology and Society, 11*(1).

Johnson, T. R., & Hanes, S. P. (2018). Considering social carrying capacity in the context of sustainable ecological aquaculture. In C. P. Heidkamp, & J. Morrissey (Eds.), *Towards coastal resilience and sustainability* (pp. 171-187). Routledge.

Johnson, T. R., Beard, K., Brady, D. C., Byron, C. J., Cleaver, C., Duffy, K., ... & Yuan, J. (2019). A social-ecological system framework for marine aquaculture research. *Sustainability, 11*(9), 2522.

Johnson, T. R. (2020). Reflecting on Maine's changing productive coastal region. *Maine Policy Review, 29*(2), 91-97.

Kaszynski, E. (2016). "Look, a [picture]!": Visuality, race, and what we do not see. *Quarterly Journal of Speech, 102*(1), 62-78.

Keck, M., & Sakdapolrak, P. (2013). What is social resilience? Lessons learned and ways forward. *Erdkunde, 67*(1), 5-19.

Kędra, J. (2018). What does it mean to be visually literate? Examination of visual literacy definitions in a context of higher education. *Journal of Visual Literacy, 37*(2), 67-84.

Kong, T. M., Kellner, K., Austin, D. E., Els, Y., & Orr, B. J. (2015). Enhancing participatory evaluation of land management through photo elicitation and photovoice. *Society & Natural Resources, 28*(2), 212-229.

Lackovic, R. (2019). *A history of oysters in Maine (1600s-1970s)*. Darling Marine Center Historical Documents. https://digitalcommons.library.umaine.edu/dmc_documents/22

Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., ... & Thomas, C. J. (2012). Transdisciplinary research in sustainability science: practice, principles, and challenges. *Sustainability Science, 7*(1), 25-43.

Lapenta, F. (2011). Some theoretical and methodological views on photo-elicitation. In E. Margolis, & L. Pauwels (Eds.), *The SAGE handbook of visual research methods* (pp. 201-213). SAGE Publications.

Larsson, S. (2009). A pluralist view of generalization in qualitative research. *International Journal of Research & Method in Education, 32*(1), 25-38.

Latz, A. O. (2017). *Photovoice research in education and beyond: A practical guide from theory to exhibition*. Routledge.

Latz, A. O. (2012). Toward a new conceptualization of photovoice: Blending the photographic as method and self-reflection. *Journal of Visual Literacy, 31*(2), 49-70.

Lejano, R. P., Casas, E. V., Montes, R. B., & Lengwa, L. P. (2018). Weather, climate, and narrative: A relational model for democratizing risk communication. *Weather, Climate, and Society, 10*(3), 579-594.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. SAGE Publications.

Lincoln, Y. S., & Guba, E. G. (2013). *The constructivist credo*. Left Coast Press.

Lindlof, T. R., & Taylor, B. C. (2011). *Qualitative communication research methods*. SAGE publications.

Lofton, S., & Grant, A. K. (2021). Outcomes and intentionality of action planning in photovoice: A literature review. *Health Promotion Practice, 22*(3), 318-337.

Loy, L. S., & Spence, A. (2020). Reducing, and bridging, the psychological distance of climate change. *Journal of Environmental Psychology, 67*, 101388.

Madsen, W., & O'Mullan, C. (2016). Perceptions of community resilience after natural disaster in a rural Australian town. *Journal of Community Psychology, 44*(3), 277-292.

Maguire, P. (1987). *Doing participatory research: A feminist approach*. University of Massachusetts.

Maine Climate Council. (2020). *Scientific assessment of climate change and its effects in Maine: A report by the Scientific and Technical Subcommittee of the Maine Climate Council.* https://climatecouncil.maine.gov/reports

Maine Department of Marine Resources. (2021). *Aquaculture in Maine.* https://www.maine.gov/dmr/aquaculture/

Marafiote, T., & Plec, E. (2006). From dualisms to dialogism: Hybridity in discourse about the natural world. *The Environmental Communication Yearbook, 3*(1), 49-75.

Masterson, V. A., Mahajan, S. L., & Tengö, M. (2018). Photovoice for mobilizing insights on human well-being in complex social-ecological systems. *Ecology and Society, 23*(3).

Matusiak, K. K., Heinbach, C., Harper, A., & Bovee, M. (2019). Visual literacy in practice: Use of images in students' academic work. *College & Research Libraries, 80*(1), 123-139.

McComas, K., Besley, J. C., & Black, L. W. (2010). The rituals of public meetings. *Public Administration Review, 70*(1), 122-130.

McGaurr, L. (2016). The photography of debate and desire: Images, environment and the public sphere. *Ethical Space, 13*(2/3), 16-34.

McGinnis, M. D., & Ostrom, E. (2014). Social-ecological system framework: Initial changes and continuing challenges. *Ecology and Society, 19*(2).

McGreavy, B., Randall, S., Quiring, T., Hathaway, C., & Hillyer, G. (2018). Enhancing adaptive capacities in coastal communities through engaged communication research: Insights from a statewide study of shellfish co-management. *Ocean & Coastal Management, 163*, 240-253.

McGreavy, B. (2016). Resilience as discourse. *Environmental Communication, 10*(1), 104-121.

McKeown, B., & Thomas, D. B. (2013). *Q methodology.* SAGE Publications.

Messaris, P. (1994). *Visual literacy: Image, mind, and reality.* Westview Press.

Metag, J., Schäfer, M. S., Füchslin, T., Barsuhn, T., & Kleinen-von Königslöw, K. (2016). Perceptions of climate change imagery: Evoked salience and self-efficacy in Germany, Switzerland, and Austria. *Science Communication, 38*(2), 197-227.

Milbourn, A. (2013). A big picture approach: Using embedded librarianship to proactively address the need for visual literacy instruction in higher education. *Art Documentation 32*(2), 274-283.

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). Qualitative data analysis: A methods sourcebook. SAGE Publications.

Mirzoeff, N. (1998). *The visual culture reader.* Routledge.

Mirzoeff, N. (1999). *An introduction to visual culture*. Routledge.

Mitchell, F. M., Billiot, S., & Lechuga-Peña, S. (2020). Utilizing photovoice to support indigenous accounts of environmental change and injustice. *Genealogy, 4*(2), 51.

Mitchell, C. (2011). *Doing visual research.* SAGE Publications.

Morse, W. C., Cox, C., & Anderson, C. J. (2020). Using public participation geographic information systems (PPGIS) to identify valued landscapes vulnerable to sea level rise. *Sustainability, 12*(17), 6711.

Murray, M., Anthony, J. R., Noblet, C. L., & Rickard, L. N. (2017). 2*017 National aquaculture survey results* [Technical report, Sustainable Ecological Aquaculture Network]. University of Maine.

National Academies of Sciences, Engineering, and Medicine (2018). *Learning through citizen science: Enhancing opportunities by design*. The National Academies Press.

National Foundation for the Improvement of Education (1983). *Cameras in the curriculum: A challenge to teacher creativity*. https://files.eric.ed.gov/fulltext/ED260697.pdf

Neptune, G. (2015). Naming the Dawnland: Wabanaki place names on Mount Desert Island. *Chebacco: The Magazine of the Mount Desert Island Historical Society*, *16*, 92-108.

Norgaard, K. M. (2012). Climate denial and the construction of innocence: Reproducing transnational environmental privilege in the face of climate change. *Race, Gender & Class, 19*(1), 80-103.

Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology, 41*(1), 127-150.

O'Neill, S. J., Boykoff, M., Niemeyer, S., & Day, S. A. (2013). On the use of imagery for climate change engagement. *Global Environmental Change, 23*(2), 413-421.

Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science*, *325*(5939), 419-422.

Pahl-Wostl, C. (2009). A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global Environmental Change, 19*(3), 354-365.

Partelow, S. (2018). A review of the social-ecological systems framework. *Ecology and Society, 23(*4).

Pateman, R. M., Dyke, A., & West, S. E. (2021). The diversity of participants in environmental citizen science. *Citizen Science: Theory and Practice, 6*(1), 1-16.

Pauwels, L. (2008). Visual literacy and visual culture: Reflections on developing more varied and explicit visual competencies. *The Open Communication Journal, 2*(1), 79-85.

Peeples, J. (2011). Toxic sublime: Imaging contaminated landscapes. *Environmental Communication, 5*(4), 373-392.

Peña Alonso, E. J. (2018). *Visualizing visual literacy* [Doctoral dissertation, University of British Columbia]. UBC Theses and Dissertations.

Peirce, C. S. (1991). *Peirce on signs: Writings on semiotics*. The University of North Carolina Press.

Peterson, M. N., Peterson, M. J., & Peterson, T. R. (2007). Environmental communication: Why this crisis discipline should facilitate environmental democracy. *Environmental Communication*, *1*(1), 74-86.

Pezzullo, P., & Cox, R. (2018). Environmental communication and the public sphere. SAGE Publications.

Powell, N. S., Larsen, R. K., & van Bommel, S. (2014). Meeting the 'Anthropocene' in the context of intractability and complexity: Infusing resilience narratives with intersubjectivity. *Resilience, 2*(3), 135-150.

Putnam, L. L., & Holmer, M. (1992). Framing, reframing, and issue development. In L. L. Putnam, & M. E. Roloff (Eds.), *Communication and negotiation* (pp. 128-155). SAGE Publications.

Ramlo, S. E. (2015). Q Methodology as a tool for program assessment. *Mid-Western Educational Researcher*, 27(3), 207-223.

Randhawa, B. S., & Coffman, W. E. (Eds.). (1978). *Visual learning, thinking, and communication*. Academic Press.

Reser, J. P., & Bradley, G. L. (2020). The nature, significance, and influence of perceived personal experience of climate change. *Wiley Interdisciplinary Reviews: Climate Change, 11*(5), e668.

Rickard, L. N., Britwum, K., Noblet, C. L., & Evans, K. S. (2020). Factory-made or farm fresh? Measuring US support for aquaculture as a food technology. *Marine Policy, 115*, 103858.

Rickard, L. N., & Feldpausch-Parker, A. M. (2016). Of sea lice and superfood: A comparison of regional and national news media coverage of aquaculture. *Frontiers in Communication, 1*, 14.

Rickard, L. N., Noblet, C. L., Duffy, K., & Christian Brayden, W. (2018). Cultivating benefit and risk: Aquaculture representation and interpretation in New England. *Society & Natural Resources, 31*(12), 1358-1378.

Rickard, L. N., Schuldt, J. P., Eosco, G. M., Scherer, C. W., & Daziano, R. A. (2017). The proof is in the picture: The influence of imagery and experience in perceptions of hurricane messaging. *Weather, Climate, and Society, 9*(3), 471-485.

Rose, G., & Tolia-Kelly, D. P. (2012). Visuality/materiality: Introducing a manifesto for practice. In G. Rose, & D. P. Tolia-Kelly (Eds.),*Visuality/materiality: Images, objects and practices* (pp. 1-11). Ashgate.

Rose, G. (2016). *Visual methodologies: An introduction to researching with visual materials*. SAGE Publications.

Roter, D. L., Rudd, R. E., Frantz, S. C., & Comings, J. P. (1981). Community-produced materials for health education. P*ublic Health Reports, 96*(2), 169-172.

Rudd, R. E., & Comings, J. P. (1994). Learner developed materials: An empowering product. *Health Education Quarterly, 21*(3), 313-327.

Rudiak-Gould, P. (2013). "We have seen it with our own eyes": why we disagree about climate change visibility. *Weather, Climate, and Society, 5*(2), 120-132.

Schmitt, C. (2017). Fisheries history of the Bagaduce River. Maine Sea Grant. https://seagrant.umaine.edu/wp-content/uploads/sites/467/2019/05/Fisheries-History-of-the-Bagaduce-River.pdf

Schlosberg, D., & Collins, L. B. (2014). From environmental to climate justice: Climate change and the discourse of environmental justice. *Wiley Interdisciplinary Reviews: Climate Change, 5*(3), 359-374.

Schoen, M. J. (2014). Teaching visual literacy skills in a one-shot session. *Visual Resources Association Bulletin, 41*(1), 1-12.

Schwarz, E. A. G. (2013). Visualizing the Chesapeake Bay watershed debate. *Environmental Communication, 7*(2), 169-190.

Seels, B. A. (1994). Visual literacy: The definition problem. In D. M. Moore, & F. M. Dwyer (Eds.), *Visual literacy: A spectrum of visual learning* (pp. 97-112). Educational Technology Publications.

Serafini, F. (2017). Visual literacy. *Oxford Research Encyclopedia of Education* (pp. 1-23). Oxford University Press.

Shirk, J. L., Ballard, H. L., Wilderman, C. C., Phillips, T., Wiggins, A., Jordan, R., ... & Bonney, R. (2012). Public participation in scientific research: A framework for deliberate design. *Ecology and Society, 17*(2).

Sinclair, K., Rawluk, A., Kumar, S., & Curtis, A. (2017). Ways forward for resilience thinking: Lessons from the field for those exploring social-ecological systems in agriculture and natural resource management. *Ecology and Society, 22*(4).

Sontag, S. (2001). On photography. Picador. (Original work published in 1977).

Spence, A., Poortinga, W., Butler, C., & Pidgeon, N. F. (2011). Perceptions of climate change and willingness to save energy related to flood experience. *Nature Climate Change, 1*(1), 46-49.

Spence, A., Poortinga, W., & Pidgeon, N. (2012). The psychological distance of climate change. *Risk Analysis, 32*(6), 957-972.

Stephenson, W. (1993). Introduction to Q-methodology. *Operant Subjectivity, 17*(1/2), 1-13.

Strack, R. W., Lovelace, K. A., Jordan, T. D., & Holmes, A. P. (2010). Framing photovoice using a social-ecological logic model as a guide. *Health Promotion Practice, 11*(5), 629-636.

Sturken, M., & Cartwright, L. (2018). *Practices of looking*. Oxford University Press.

Sunwolf, & Seibold, D. R. (1999). The impact of formal procedures on group processes, members, and task outcomes. In L. R. Frey, D. S. Gouran, & M. S. Poole (eds.), T*he handbook of group communication theory and research* (pp. 395-431). SAGE Publications.

Taylor, T. (2011). Video conferencing vs talking face-to-face: Is video suitable for supportive dialogue? *International Journal of Therapy and Rehabilitation, 18*(7), 392-402.

Thompson, D. S., & Beene, S. (2020). Uniting the field: Using the ACRL Visual Literacy Competency Standards to move beyond the definition problem of visual literacy. *Journal of Visual Literacy, 39*(2), 73-89.

Trumbo, J. (1999). Visual literacy and science communication. *Science Communication, 20*(4), 409-425.

Tuler, S., & Webler, T. (2010). How preferences for public participation are linked to perceptions of the context, preferences for outcomes, and individual characteristics. *Environmental Management, 46*(2), 254-267.

U.S. Census Bureau. (2021). 2019 American Community Survey Estimates. https://data.census.gov/

University of Maine. (2021). *Aquaculture*. https://dmc.umaine.edu/welcome/history/history-aquaculture/

University of Maine. (2021). *Maine Midden Minders*. https://umaine.edu/middenminders/

Van Dijck, J. (2008). Digital photography: Communication, identity, memory. *Visual Communication, 7*(1), 57-76.

Van House, N. A., Davis, M., Takhteyev, Y., Ames, M., & Finn, M. (2004). The social uses of personal photography: Methods for projecting future imaging applications [Working paper]. University of California.

Van House, N. A. (2011). Personal photography, digital technologies and the uses of the visual. *Visual Studies, 26*(2), 125-134.

Wang, C. C. (1999). Photovoice: A participatory action research strategy applied to women's health. *Journal of Women's Health, 8*(2), 185-192.

Wang, C., & Burris, M. A. (1994). Empowerment through photo novella: Portraits of participation. *Health Education Quarterly, 21*(2), 171-186.

Wang, C., & Burris, M. A. (1997). Photovoice: Concept, methodology, and use for participatory needs assessment. *Health Education & Behavior, 24*(3), 369-387.

Wang, C. C., & Redwood-Jones, Y. A. (2001). Photovoice ethics: Perspectives from Flint photovoice. *Health Education & Behavior, 28*(5), 560-572.

Watts, S., & Stenner, P. (2005). Doing Q methodology: Theory, method and interpretation. *Qualitative Research in Psychology, 2*(1), 67-91.

Watts, S., & Stenner, P. (2012). *Doing Q methodological research: Theory, method and interpretation*. SAGE Publications.

Webler, T., Danielson, S., & Tuler, S. (2009). Using Q method to reveal social perspectives in environmental research. *Social and Environmental Research Institute*, *54*, 1-45.

Whitacre, B. E., & Mills, B. F. (2007). Infrastructure and the rural – Urban divide in high-speed residential Internet access. *International Regional Science Review, 30*(3), 249-273.

Wilmsen, C., Elmendorf, W. F., Fisher, L., Ross, J., Sarathy, B., & Wells, G. (Eds.). (2012). *Partnerships for empowerment: Participatory research for community-based natural resource management*. Earthscan.

APPENDIX A

Supplemental Tables for Factor Interpretation

Table A.1

Defining statements for Factor 1

Visual literacy skills engaged

Rank	Z-Score	Skill	Statement	No.
4	1.94*	Identify	Capture what is important to me	10
4	1.81*	Evaluate	Appreciate the aesthetic experience this place provides	28
3	1.23*	Create	Create a meaningful story	12
3	1.05*	Communicate	Communicate my perspective creatively	7

Visual literacy skills not engaged

Rank	Z-Score	Skill	Statement	No.
-3	-1.19*	Evaluate	Evaluate how effectively other people communicate	14
-3	-1.20	Change	Change my perspective about others	30
-4	-1.88	Change	Change my intentions to act with respect to this place	25
-4	-2.23*	Change	Change my perspective about this place	3

Note. Statements participants ranked highest and lowest on average. Asterix indicate statements ranked significantly different than participants in the other factor (p < .01).

Table A.2

Defining statements for Factor 2

Visual literacy skills engaged

Rank	Z-Score	Skill	Statement	No.
4	1.87*	Identify	Identify what other people value	29
4	1.81*	Analyze	Analyze what is going on in my surroundings	27
3	1.59*	Evaluate	Evaluate the impact of my views on other people	4
3	1.28	Create	Create meaning collaboratively with other people	8

Visual literacy skills not engaged

Rank	Z-Score	Skill	Statement	No.
-3	-1.01*	Create	Represent an abstract idea or argument	21
-3	-1.20*	Identify	Capture what is important to me	10
-4	-1.98	Change	Change my intentions to act with respect to this place	25
-4	-2.56*	Communicate	Communicate beyond the scope of this project	19

Note. Statements participants ranked highest and lowest on average. Asterix indicate statements ranked significantly different than participants in the other factor ($p < .01$).

APPENDIX B

IRB Approval

APPLICATION FOR APPROVAL OF RESEARCH WITH HUMAN SUBJECTS
Protection of Human Subjects Review Board, 400 Corbett Hall

(Type inside gray areas)
PRINCIPAL INVESTIGATOR: Kevin Duffy   **EMAIL:** kevin.duffy1@maine.edu
CO-INVESTIGATOR: Laura Rickard   **EMAIL:** laura.rickard@maine.edu
CO-INVESTIGATOR: **EMAIL:**
FACULTY SPONSOR: Laura Rickard   **EMAIL:**
  (Required if PI is a student):
TITLE OF PROJECT: Maine coastal residents' visions of change
START DATE: 6/01/2019   **PI DEPARTMENT: Communication and Journalism**

STATUS OF PI: FACULTY/STAFF/GRADUATE/UNDERGRADUATE   G (F,S,G,U)

    If PI is a student, is this research to be performed:

☐	for an honors thesis/senior thesis/capstone?	☐	for a master's thesis?
☒	for a doctoral dissertation?	☐	for a course project?
☐	other (specify)		

Submitting the application indicates the principal investigator's agreement to abide by the responsibilities outlined in Section I.E. of the Policies and Procedures for the Protection of Human Subjects.

Faculty Sponsors are responsible for oversight of research conducted by their students. The Faculty Sponsor ensures that he/she has read the application and that the conduct of such research will be in accordance with the University of Maine's Policies and Procedures for the Protection of Human Subjects of Research. REMINDER: if the principal investigator is an undergraduate student, the Faculty Sponsor MUST submit the application to the IRB.

Email this cover page and complete application to UMRIC@maine.edu

****
FOR IRB USE ONLY   Application # 2019-04-13   Review (F/E): E Expedited Category:
ACTION TAKEN:

☒	**Judged Exempt; category 2 Modifications required? Y Accepted (date) 05/09/2019**
☐	**Approved as submitted. Date of next review: by Degree of Risk:**
☐	**Approved pending modifications. Date of next review: by Degree of Risk:**
	Modifications accepted (date):
☐	**Not approved (see attached statement)**
☐	**Judged not research with human subjects**

    FINAL APPROVAL TO BEGIN   5/9/2019
                                              Date

                                                                                      10/2018

Informed Consent

You have been asked to participate in a research study based on where you live in Maine, and/or your connection to a local environmental organization. This study is being conducted by University of Maine researchers, including Kevin Duffy, a graduate student, Dr. Laura Rickard, an Associate Professor, and Dr. Bridie McGreavy, an Assistant Professor, in the Department of Communication and Journalism; as well as Dr. Teresa Johnson, an Associate Professor in the School of Marine Sciences. The purpose of the study is to better understand the impact of coastal development on coastal resilience in local communities. To do so, we are asking residents to help us collect data. Please note that you must be at least 18 years old to participate.

What Will You be Asked to Do?
You will be asked to take part in four 1-2 hour meetings and contribute 10 or more original photographs. The first meeting will be an orientation, where you will learn about the research project and receive a photo assignment (e.g., photograph sites along the river where you have observed change). The second meeting will include a short questionnaire about your local experience and one-on-one discussion with the researcher about your photos and what they mean to you (e.g., how does the photograph communicate your experience of change?). The third meeting will be an opportunity to share your photographs taken for the assignment and to discuss their role in shaping your vision of community with your fellow community participants (e.g., how does this photograph relate to y/our life?). The fourth meeting will offer a chance to discuss your experience and debrief the project through an interactive survey (e.g., which statements are most like your experience with photovoice?). The meetings will be held remotely via a password-protected video call and video/audio recorded, so that the researchers may review them at a later time. Please also note that participation in this study implies consent to have a selection of photographs released for a public exhibition organized by the research team.

Risks
Except for your time and inconvenience, there are no foreseeable risks to you in participating in these community meetings.

Benefits
There are no direct benefits for you to participate in this research study. However, by participating you will learn about coastal development and its possible impacts on community resilience.

Compensation

You will be provided with light refreshments (i.e., bottled water, coffee, baked goods) during any in-person research meetings you attend.

Confidentiality

The information and photographs you provide during the community meetings will be treated as professional confidence. No information that might directly identify you will be presented in any research reports or presentations. Since the community meetings will be held in a group setting, however, we cannot guarantee confidentiality of your responses among other members of the group. Video and audio recordings of all meetings will be accessible only to the research team and transcribed by Kevin Duffy. The recordings will be downloaded off of the video cameras to Duffy's computer, and then immediately deleted from the device. Recordings and transcripts will be stored on a password-protected computer (in a locked office) and will be destroyed by January 2022.

Voluntary

Participation is voluntary. If you choose to take part in the study, you may skip any questions and/or stop at any time.

Contact Information

If you have additional questions, comments, or concerns about the study, you may call or email Kevin Duffy at 262-339-5005 or kevin.duffy1@maine.edu, or Dr. Laura Rickard at 207-581-1843 or laura.rickard@maine.edu.

If you have any questions about your rights as a research participant, please contact the Office of Research Compliance, University of Maine, via phone 207-581-1498 or 207-581-2657 or via email umric@maine.edu.

APPENDIX D

Interview Guide for Interviews and Group Discussion

1. How did you come to be involved in this project?

2. How does this project relate to your previous experience with photography?

3. How did you decide what to photograph?

4. Can you tell me the story of your collection of photos?

5. Can you tell me/us about the story behind this particular photograph?

   a. Why did you take this photo? What was your motivation?

   b. What does this photo show? Where was the photo taken?

   c. What made you choose this particular photograph/site?

   d. How does this photograph relate to y/our life?

6. Can you tell me/us how this photograph captures the project themes?

   a. How and why does this photo show what you value about this place?

   b. How and why does this photo show changes that affect your value of this place?

7. Does this photo capture any additional themes?

8. How would you go about changing the situation in the photo, so it reflects the kind of environment that you wish to see/engage in the future?

9. How could these photos be used to educate people about your community?

10. What photos are most representative of how you see your community?

APPENDIX E

Interview Guide for Q Evaluation

1. How did the sorting process feel overall?

2. How would you describe your overall experience working on the photovoice project?

3. Why do you feel these two statements ('4') are most reflective of your experience?

4. Why do you feel these two statements ('-4') are most unlike your experience?

5. Were there any statements that were particularly difficult to place? Why?

6. Why did you place statement X in this position but statement Y in this position?

7. Were there any views that reflect your project experience that seem to be missing from this statement set?

8. If you were able, would you move the position of the median ('0') to have a greater or lesser number of photos which you marked 'MOST LIKE' your experience? Why?

APPENDIX F

Group Orientation Slides

Ethics in Photography and Photovoice

Invasion of privacy
- Ask for permission to photograph people or to access private property
- Be open to discuss the project and your involvement in it

Portrayal and representation
- Aim for accurate representation through photos and narratives
- Do not show anyone in negative light or embarrassing circumstances
- Understand subjects are vulnerable even if they grant permission

Consent for Participation

- Your participation is voluntary
- You may stop participating at any time
- Meetings and interviews will be video and audio recorded
- Your photos may be used in research reports and presentations
  - But … you will maintain ownership over your photos
- No information that might directly identify you will be used in research reports or presentations

Building a Team Contract for Civil Dialogue

Research Goals for the Project

- Identify and document your values related to this place
- Understand what changes to this place are "visible" to your community
- Evaluate the role of our dialogue in building community understanding

What camera will you be using for this project?

Basic Considerations for Photography

Photo meaning is more important than quality
- Compose your photos for a specific purpose
  - Use camera either horizontally or vertically
  - Consider framing and perspective/angles
  - Plan out your distance/depth of field

- Be mindful of photo clarity, focus, and background lighting
  - Keep your fingers away from camera lens
  - Keep the sun to your back or side

Photography Assignments for the Project

Before our next team meeting …
- Take at least 5 photos in response to each assignment (below)
- Write 2-5 sentence caption for each photo taken
- Keep personal notes about why you took each photo
- Select 2 photos for use in team discussion

Project photo assignments
1. Take photos to show what you value about this place
2. Take photos to show changes that affect how you value this place

Submitting Photos for the Project

Preferred Option
- Upload photos using URL link provided by Kevin via email

Alternative Option
- Email photos to Kevin directly (kevin.duffy1@maine.edu)

Interviews About Individual Photos

• After you have taken photos and uploaded your photos, contact Kevin to set up a time to discuss them in May

• You will be asked about why you took the photos, how they respond to the prompts, and what they mean to you

• Your photo journals will help guide you through this interview

Creating a Plan for Your Photography

Scheduling Our Next Team Meeting

APPENDIX G

Combined Group Discussion Slides

Photovoice
Team Discussion

Kevin Duffy, PhD candidate and instructor
Communication and Journalism @ UMaine

Voicing
Our
Individual &
Collective
Experience

Agenda

1. Discuss photos
2. Identify overall themes
3. Consider next steps

Reviewing team contract for discussion

• Recognize our shared human dignity: "We're all in this together"

• Speak from own experience and only on behalf of self

• Be respectful of different viewpoints and ask questions

• Aim for dialogue about diversity and understanding, not debate nor consensus

• Provide room for others to speak by listening without interruption

Process for photo discussion

1. Kevin: Introduce each photo, photographer, and caption
2. Team: Respond to photo, identifying explicit and implicit meaning(s) and relationship to your own experience of the river/community
3. Kevin & Team: Reflect on overall issues, themes, theories that arise in our discussion

Take photos to show what you VALUE about the river and its surrounding communities

Photo Assignment #1

Bagaduce: Value photo #1

Bagaduce: Value photo #2

Bagaduce: Value photo #3

Bagaduce: Value photo #4

Damariscotta: Value photo #1

Damariscotta: Value photo #2

Damariscotta: Value photo #3

Damariscotta: Value photo #4

Damariscotta: Value photo #5

Overall themes, issues, or tensions that represent value …

Take photos to show CHANGES that affect how you value the river and surrounding communities

Photo Assignment #2

Bagaduce: Change photo #1

Bagaduce: Change photo #2

Bagaduce: Change photo #3

ERRATIC TRAIL

Bagaduce: Change photo #4

Damariscotta: Change photo #1

Damariscotta: Change photo #2

Damariscotta: Change photo #3

Damariscotta: Change photo #4

Damariscotta: Change photo #5

Overall themes, issues, or tensions that represent change …

Opportunities and threats facing the river and community …

Next steps

• Interest in project analysis and viability of project evaluation

• Printing and framing photos for public exhibition

• Inviting outside perspectives (organizations, institutions, departments, etc.)

• Photo attribution in research

BIOGRAPHY OF THE AUTHOR

Kevin Patrick Duffy was born in Milwaukee, Wisconsin. He was raised in Cedarburg, Wisconsin and graduated from Marquette University High School in 2010. He earned a B.A. in Science Writing at the University of St. Thomas in 2014 and an M.A. in Environmental Journalism at Michigan State University in 2016. He has co-authored six publications appearing in multiple journals, including *Science Communication* and the *Journal of Environmental Studies and Sciences*. He is a candidate for the Doctor of Philosophy degree in Communication from the University of Maine in December 2021.